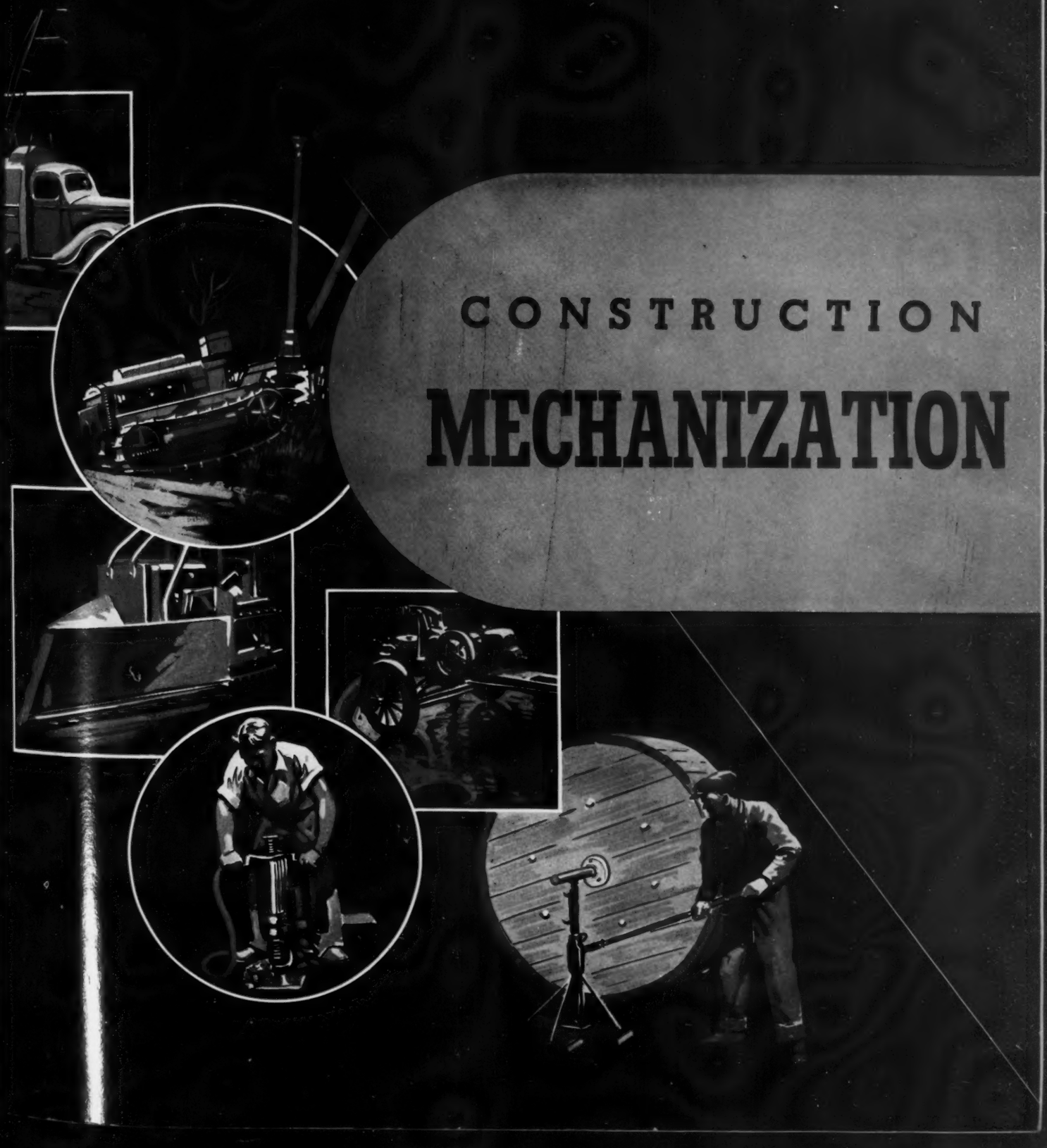
Electrical World



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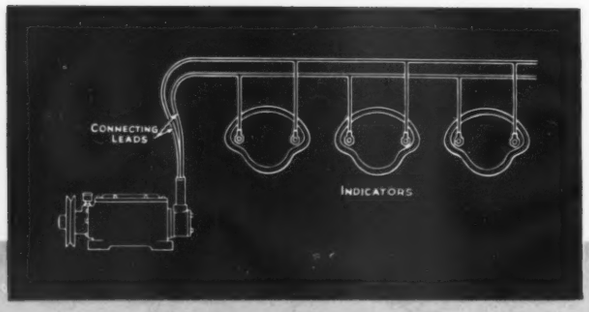
Because of their simplicity, flexibility and dependable accuracy, WESTON Tachometers are widely used throughout industry on pumping and conveyor systems, continuous dryers and bake ovens, kilns, and wherever else accurate RPM indication furnishes the key to accurate control. Indicators are furnished to meet any specific need; calibrated in RPM—pieces per hour—gallons per minute—or any other function of the RPM.



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mount the small magneto at the rotating part and the indicator wherever desired, then connect them with a pair of wires. That completes the installation when WESTON Electrical Tachometers are used. With no shafting to install, even acute angles or long distances present no difficulty.

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Flexibility . . .

the Electrical Tachometer can be adapted to any system of control since any number of indicators can be connected to one magneto and mounted wherever desired, even far removed from the drive.

WESTON engineers will gladly assist in adapting dependable WESTON ELECTRICAL *Indication to your product or process. Communicate with the* WESTON *office in your vicinity, or write to . . . Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark, N. J.*

WESTON *Instruments*

LETTERS TO THE EDITOR

Fiber Glass Compared With Asbestos

To the Editor of ELECTRICAL WORLD:

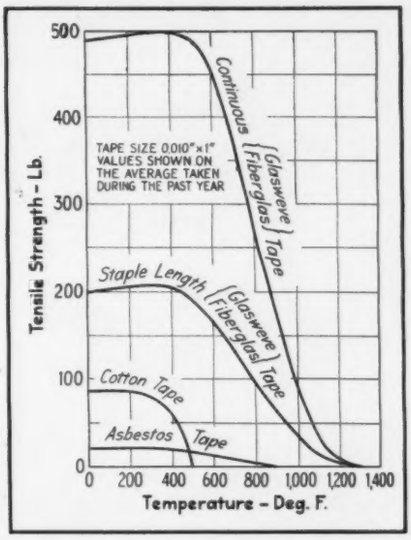
The article "Glass Fiber Enters Electrical Insulation Field" (ELECTRICAL WORLD, November 19, 1938, page 40) gives an interesting slant on glass insulation even to those of us who are familiar with the subject. It should be doubly interesting and valuable in introducing your readers to this newest insulating material.

We who have had the interesting job of incorporating glass insulation into electrical machine design and developing the technique of using it have been impressed with the significance of this development. To paraphrase an old saw, it is a case of "familiarity breeds respect." You may be interested in some of the more technical aspects of this material which we believe to be of tremendous consequence.

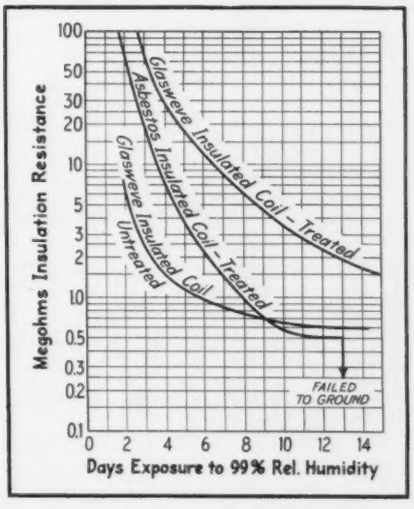
Of primary importance is the mechanical strength of glass textiles particularly after exposure to elevated temperatures. It is well known that organic materials have definite limitations in this respect. The accompanying illustration (top) tells better than words the whole story.

Glass textiles are "non-hygroscopic" as the individual fibers are almost infinitesimal glass rods and cannot absorb moisture into themselves as do other fibers. The bottom cut shows the importance of this characteristic in respect to the effect of exposure to humidity on insulation resistance. It is significant that the coil insulated with untreated glass eventually stabilizes at a higher insulation resistance than the coil insulated with treated asbestos. This is interpreted to indicate that the effect of moisture absorption by the fibers (of asbestos), even when treated, is of greater moment than the accumulation of moisture between the untreated glass fibers.

The development of glass insulation has been very rapid in recent months and numerous studies are being made for its application to all fields of rotating electrical machinery and control apparatus. However, I believe that for the present it should be applied with judgment only where its advantages serve a useful purpose. In general, this covers applications where high temperature, vibration and excessive moisture conditions are encountered.



1. Tensile strength of fiber glass superior at higher temperatures. Tape size 0.010 x 1 inch.



2. Effect of exposure to 99 per cent relative humidity on coils impregnated with solventless varnish as compared to no treatment.

GRAHAM LEE MOSES,
Westinghouse Elec. & Mfg. Co.
East Pittsburgh, Pa.

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Amplifies Cable Formulas

To the Editor of ELECTRICAL WORLD:

Will you please publish the following comments on an article which I wrote, entitled "Unbalanced Currents in Parallel Cables," that appeared in the February 25, 1939, issue of the ELECTRICAL WORLD in order to clarify some apparent misunderstandings?

In connection with equation (6) it was not intended that the currents in cables B_3 and B_4 be equal, but that the derivation of the equation was on this basis. This introduces only a slight error in the result. To those readers who are interested in the value of the current in these cables the formulas are as follows:

$$B_3 = I\left(\tfrac{1}{2} - j1.73\,\frac{Y - p\,(2Y - X)}{T - j87R}\right) \quad (7)$$

and $B_4 = I - B_3$

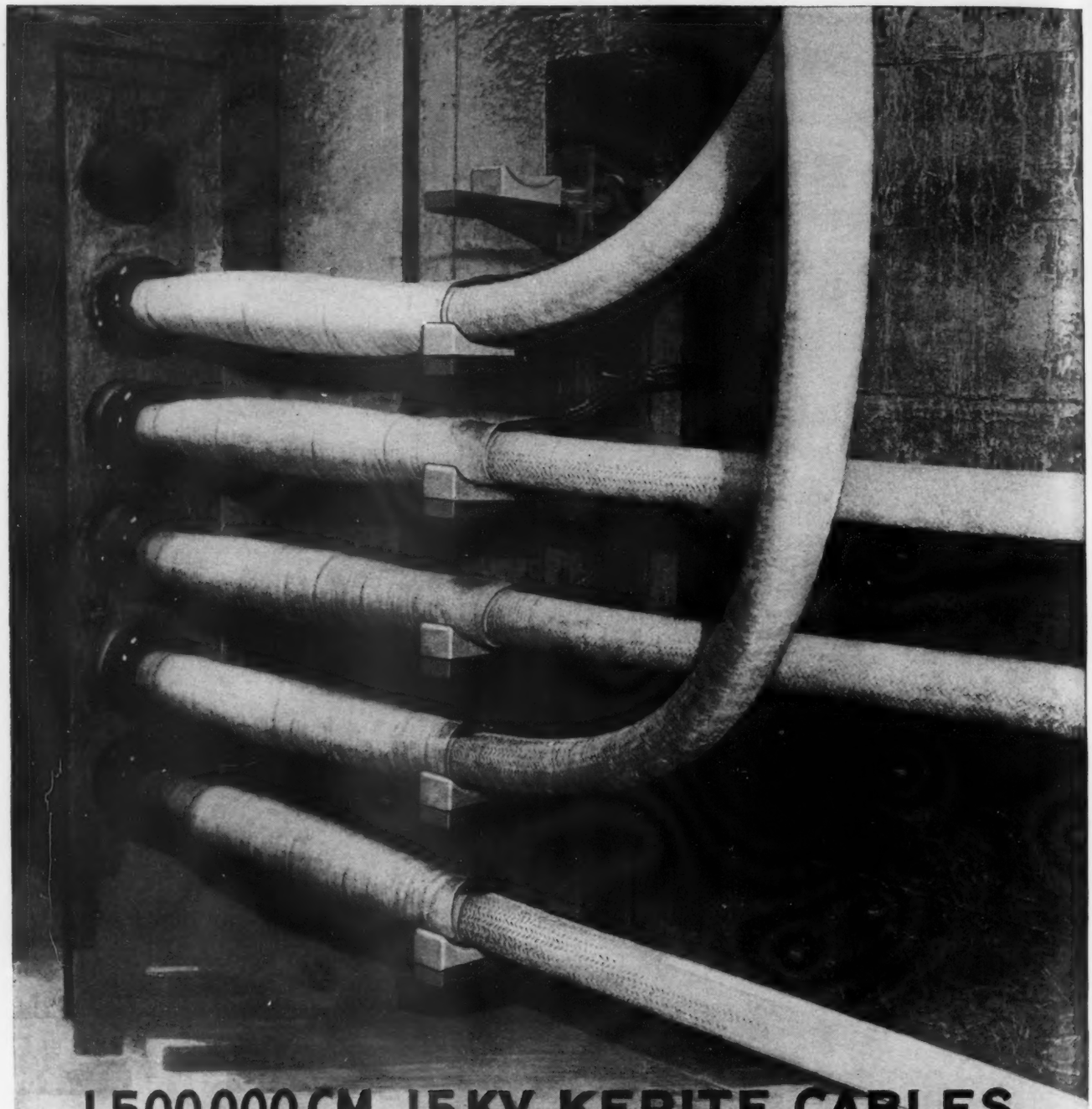
in which p, the only new factor, is the ratio of the current in cables A_1 and C_6 from equation (6) to the total phase current I.

In the representative example the currents I_3 and I_4, which were given as $500 + j0$, were not intended to be the currents in cables B_3 and B_4, but merely a reference for the currents in the other cables in order to show the unbalance. The value of these currents would be:

$$B_3 = 569 - j157 = 591$$
$$\text{and } B_4 = 431 + j157 = 459$$

These currents as well as those given in the article are all referred to the same axis rather than to their three-phase axes. This shows the unbalance of currents more readily.

ROBERT M. SENSINTAFFAR,
Denver, Colo.



1,500,000 CM 15 KV KERITE CABLES
CAHOKIA STATION
UNION ELECTRIC LIGHT AND POWER CO., ST. LOUIS
INSTALLED 1927

DAYS KERITE

THE KERITE INSULATED WIRE & CABLE COMPANY INC
NEW YORK CHICAGO SAN FRANCISCO

A Prelude to What?

Hope of peace between the New Deal administration and the electric utilities flowered briefly, but now is fading. Again a government agency is attacking privately owned utilities. For what reason? Nobody knows, but our guess is that this is but a prelude to further raids upon private ownership.

At least this is the impression given by the recent release of an ingenious—and disingenuous—study by the Federal Power Commission. It is a comparison of "Rates, Taxes and Consumer Savings" as between publicly and privately owned electric utilities. The disingenuousness appears in the very title of the study, which implies that comparison is made between taxes paid by the two groups of utilities. But inside the book the reader discovers that the comparison is really between the actual taxes that private utilities do pay—and must pay or else—and the estimated and sometimes, we suspect, hypothetical "tax equivalents" that publicly owned utilities are alleged to turn into the coffers of government. And to make a favorable showing for the darlings of the politicians, even with this initial advantage, the inspired mathematicians of the F.P.C. find it necessary to employ all their skill in "weighting" and "correcting" the revenue figures that enter the comparison.

The same lack of candor and of regard for all the facts in the case appears in the discussion of public and private ownership rates. The data are made to say that it is only in the smaller communities that it is less expensive to buy your electricity from a private company. The press release on this aspect of the report, which is practically all that will get to the public, carefully refrains from any mention of the fact that it is in these smaller communities that public ownership is most widespread and has been for many years. It would not do to admit that rates are generally higher for public ownership electricity in the population class of communities where public ownership is most frequent.

The study blandly implies by its discussion of rate reductions that these have been the most important factor in bringing down the cost of electricity to the consumer. Here again estimates and assumptions substitute for actual figures that are impossible to obtain. The figure of $162,761,490, is confidently stated as the "saving" made by rate reductions to consumers in the 3½-year period to the end of 1937. Well, if in the three years of 1935, 1936 and 1937 consumers had paid the same unit rate as in 1934, the total bill for that three-, not 3½-year period would have been $760,000,000 higher. This "saving," beside which the one claimed for rate reduction shrinks to pitiable size, was caused by increased use of electric service, inspired mostly by vigorous sales promotion by all the electrical industry.

These sales build load, which in turn requires expansion of physical system. It has been intimated time and time again that utility buying would be an important factor in business recovery. Can it be that the President, who has gained strength from depression distress, doesn't want confidence restored to business?

DESIGN CONTROL BOARDS

MORRIS S. VITELES,* *Director of Personnel Research and Training, Philadelphia Electric Company*

IT HAS BEEN suggested that in the electric industry there is wide room for modifications in the design and installation of substation equipment with a view toward reducing liability to accident and error entailed in the operation of such equipment. This proposal appears concretely, for example, in a statement by S. M. Dean, chief assistant superintendent, electrical system, of the Detroit Edison Company, who, in a letter addressed to members of the electrical equipment committee, Edison Electric Institute, writes:

"In the design of substations or any structure or equipment the natural barriers against accidents should be so obvious as to challenge any lapse in mental 'size-up' which might put the man working in a precarious position, or the design should be such that it is impossible for him to get in such a dangerous position."

In considering Mr. Dean's statement it should perhaps be recalled that considerable progress in accident reduction in the manufacturing industries has come from the provision of safety guards and allied devices which, in many instances, make it virtually impossible for the worker to become involved in an accident. The same principle has, of course, been applied in the system of interlocking switches in the electric industry which simultaneously contribute to the avoidance of both errors and accidents.

Where safety guards cannot be built into the design, it seems a psychologically sound procedure to provide something in the way of vivid "barriers" or other devices which will help arouse the active attention of the operator in sizing up the situation in order to avoid the danger of accidents and errors.

In this paper are presented a few psychological principles which, in the opinion of the author, merit consideration in arriving at modifications in substation design and installation with a view to decreasing liability to accidents and errors in substation operation.† Essentially the paper represents an attempt to apply to this problem certain principles of attention which have been developed in studies by the psychologist of similar problems in other fields.

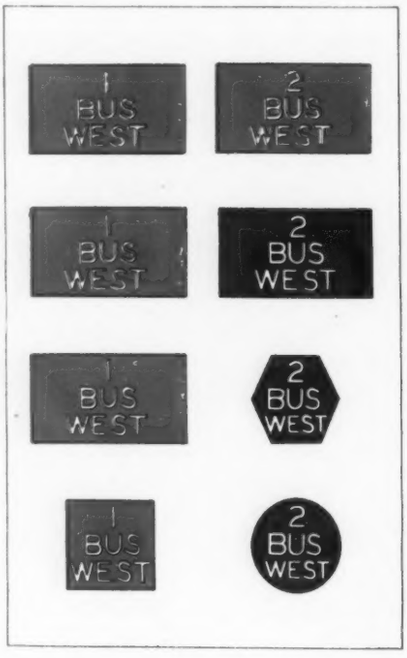


Fig. 1—Marker shape a distinguishing characteristic

It is suggested that the danger of confusing buses, with all the hazards attached thereto, could be more easily avoided if markers of different shapes were used in identifying the buses, so that, for example, Bus No. 1 would invariably, in the mind of the operator, be the bus with the square marker, and Bus No. 2 that with the octagonal or perhaps circular marker. With differences in the shapes of markers could also be combined differences in color, so that Bus No. 1 would invariably be thought of as the bus with the red and white square marker and Bus No. 2 as that with the octagonal or circular black and white, or, better still, black and yellow marker.

Effect a Size Upon Attention

Attention may be defined as a preliminary adjustment of the human machine which will enable it to deal with a problem or situation more effectively. Laboratory studies have demonstrated what must already be obvious to most of us—that the size of an object has an important bearing upon the arousal of active attention. As a matter of fact, from such studies it has been possible to formulate a law, known as the "Square Root Law of Effect," which gives the effect upon attention of given differences in size.

It seems reasonable to believe that the *principle of size* may find an application in substation design. Pull buttons, indicating lights, switches, etc., on panels might perhaps be graded in size so as to bring into prominent relief and more easily into the center of attention those particular items of equipment to which crucial significance or hazard is attached. Certainly, in identifying equipment, the size of the target or marker used should be in relation to the hazard to personal safety or accuracy of operation presented in handling the equipment. The application of this principle might mean, in terms of current system practices, that the size of the marker indicat-

*The author is also associate professor of psychology, University of Pennsylvania, author of "Industrial Psychology," "The Science of Work," "Vocational Guidance Throughout the World" and contributor of new methods for selection and training of linemen, troublemen, despatchers and switchboard operators.

This article is adapted from a paper presented to the E.E.I. electrical equipment committee at Buffalo, February 7, 1939.

†Although this paper is devoted specifically to substation design, the principles and suggestions outlined apply equally well to generating station design and perhaps to electrical equipment problems in other units of the industry.

FOR OPERATING PSYCHOLOGY

Better choice of size, arrangement, form, color and direction of control board insignia can break through mental preoccupation of operators—The purpose of suggested changes is to enable the switchboard operator to "size up" an emergency situation quickly, accurately and completely

ing No. 1 and No. 2 bus, respectively, would be considerably increased; that the targets identifying compartments containing circuit breakers and oil switches would be made larger than they now are; that, in general, an order of magnitude of identifying devices would be established having a direct relation to the importance of the equipment identified.

"Isolation" as an Aid

Allied with the factor of size in attracting and holding attention is that of *isolation.* Hazardous equipment can actually be "set off" or physically isolated from other units as an aid in attracting attention to it as the operator "sizes up" the situation. Or the panel, switches, indicating lights, instruments and so on which merit special attention in avoiding both accidents and errors can be isolated by painting the item

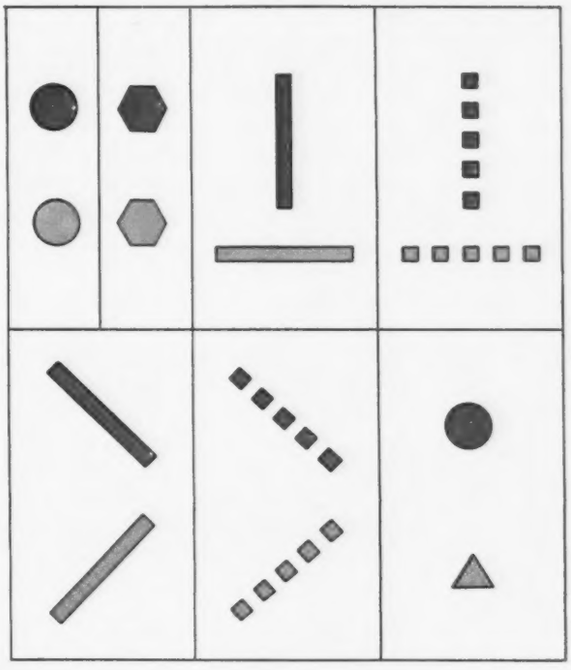


Fig. 2—Directional lights superior to usual round ones

An *illuminated red bar in line with the bus* might be chosen as the universal symbol for a closed breaker and *illuminated green bar at right angles to the bus* as the symbol for an open breaker. It might also be desirable and possible to provide an intermediate position in the form of a diagonal bar (with or without illumination or color) to indicate a breaker that needs to be opened or closed. Perhaps the effectiveness of the illuminated colored bar could be increased if a discontinuously instead of solidly lighted bar were used.

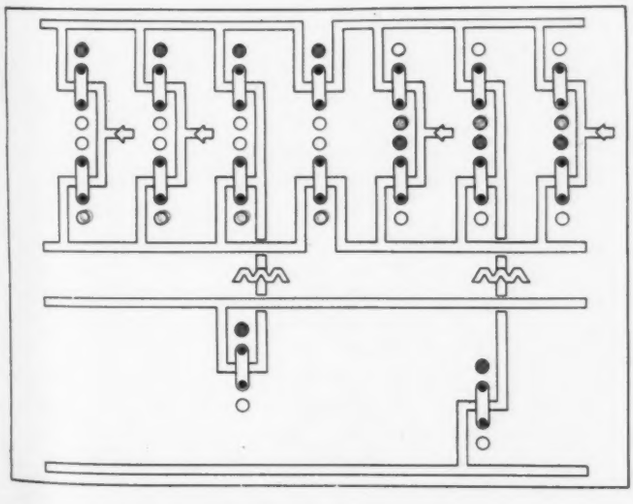


Fig. 3—Typical control board of present practice

The top section of the board shows the mimic buses and the twin pull button type of control switches for the transmission lines, transformers and bus sectionalizing oil circuit breakers. In the lower part the low-tension breakers of the transformers are shown. The familiar red and green lights indicate the positions of the breakers.

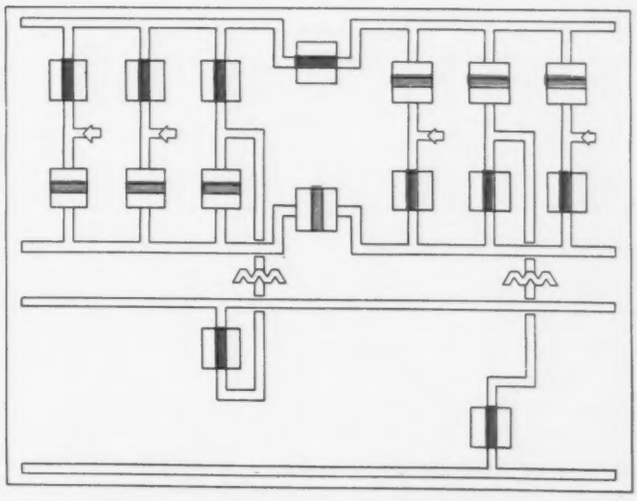


Fig. 4—Lighted positions and colors clearly show circuit conditions

An indicating light in the handle of the control switch changes from red to green and vice-versa for the appropriate switch position. In addition, it shows a *green bar at right angles* to the miniature bus when the breaker is open and a *red bar in line with the miniature bus* when the breaker is closed.

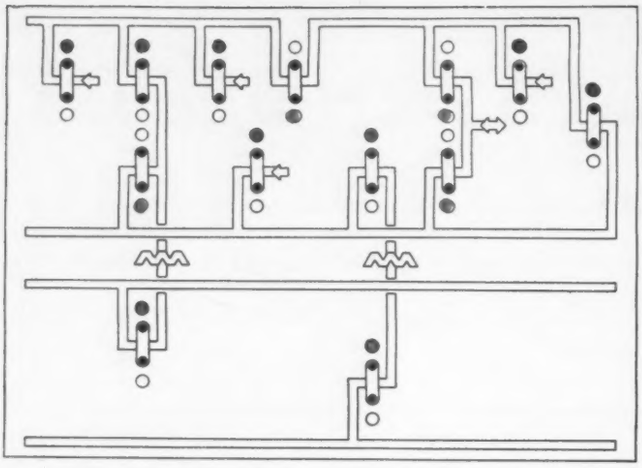


Fig. 5—Ring bus pattern in conventional style

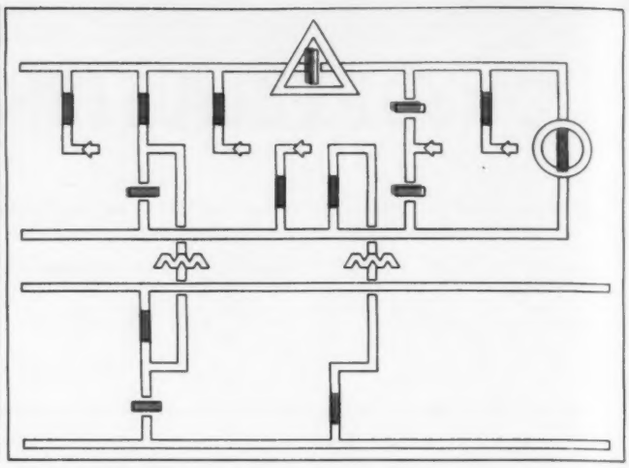


Fig. 6—Ring bus streamlined for instant perception of system set-up

Fig. 6—For greater vividness the author suggests making the triangle and circle yellow in color.

of equipment to contrast with the board, or by the simple device of a colored border. If a superfluity of color on the board is to be avoided, the equally simple device of raising or indenting the surfaces bordering upon the item of equipment to be isolated can be employed.

Associations with Shape

My observations in substations suggest that there has been a failure to capitalize upon differences in *form* or *shape* as a way of keeping an operator accurately oriented with respect to equipment under his charge. The problem here is that of establishing meaningful associations between certain types of equipment or certain situations and particular forms.

This principle has to some extent been applied in highway safety. For example, in some states an octagonally shaped sign invariably means extreme danger. The same principle might be applied in the substation, particularly in marking equipment. On the Philadelphia Electric Company System, for instance, it is the practice to identify different buses with markers of the same size and shape, labeled No. 1 Bus and No. 2 Bus, respectively, approximately as illustrated at the top of Fig. 1. How attention is facilitated by diversity in size and shape of markers appears clearly in this figure, where different markers are shown in pairs for comparative observation.

The use of differences in form need not be limited to markers alone. For example, on the Philadelphia Electric Company System—at least in some of the stations—indicating lights on 13,200-volt sectionalizing disconnect panels are shaped differently from indicating lights on other panels. This represents a sound application of the *principle of form in attention*. Unfortunately, in the case cited, the difference in the shapes of the two kinds of indicating lights is not sufficiently great to be easily perceptible. However, it would be a small matter to substitute for the octagonal or many faceted indicating light used on the 13,200-volt sectionalizing disconnect panels triangular or other shaped lights which would be in clear contrast with circular indicating lights on other panels, and therefore more useful to the operator in the process of sizing up the situation. There must be numerous other places, possibly in the construction of equipment as well as in the planning of detail, where this principle of form could be applied.

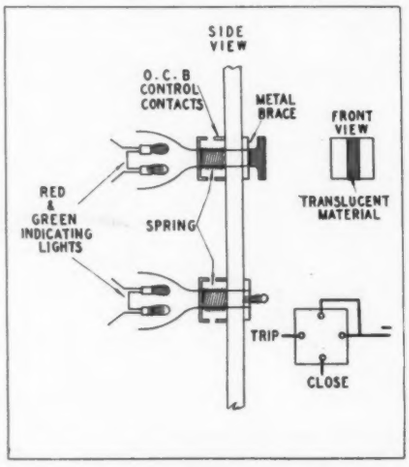


Fig. 7—Proposed control switch gives positioned, directional indication

The new feature of this device is the use of a translucent material in the T-shaped handle. On the back of the panel, or possibly in the hollow leg of the T, are the red and green indicating lamps, controlled in the usual way by the auxiliary switches on the breaker mechanism. A spring device, similar to the one used in the twin pull button control switch, keeps the closing or tripping circuit open until the T-shaped handle is pulled by the operator.

Directional Indicating Lights

Paralleling the factor of difference in form is the effect of differences in direction. One method of attracting and directing attention is to use lines or bars which have a directional aspect. In advertising, the reader's attention is forced in the desired direction through the use of arrows and other devices. In decreasing accidents on the highway the same device is frequently employed, curved arrows or other types of markers being used as aids in guiding the driver in the safe direction or in pointing out the location of potential hazards.

The *principle of direction*, I suspect, would find its most useful application in the substitution of illuminated, suitably colored bars for the round indicating lights which are almost universally employed on switchboard panels today. In the construction of switchboard panels it is common practice to depend solely upon the color of identically shaped lights, generally red and green, to indicate the setup as the operator sizes up the situation before proceeding with his work. The effectiveness of the indication, from the viewpoint of attracting and controlling attention, could be consid-

erably improved if a direction clue were added to that of color.

A glance at Fig. 2 will perhaps furnish some subjective evidence of the relative attention value of differently colored lights of the same shape as compared with illuminated, distinctively colored bars (continuous and discontinuous) lying on different planes.

Illustrations From Substation

Possibilities in the way of practical applications of these suggestions are illustrated in Figs. 3 to 7, inclusive. These furnish specific examples prepared at my request by L. E. Goodenough, supervisor of the operations department school of the Philadelphia Electric Company. Fig. 3 shows a comparatively simple control board for a transformer substation. While this is a relatively simple station, note the greater clarity of outline, the greater ease of visualizing the switching in the layout illustrated in Fig. 4. This involves, incidentally, the use of a new type of control switch described in further detail later in this article.

Fig. 5 shows a type of layout which is being used with increasing frequency, a modified form of ring bus. It is shown as it is generally installed initially. The top bus is sectionalized in the middle and the top and bottom buses may be tied together by the bus tie switch at the extreme right. Again the twin-pull button type of control switch is shown. The use of the bus sectionalizing and bus tie breakers has added to the complexity of the switching and the operator has greater need for complete visualization of his switching moves. In the diagram shown the closing of the bus sectionalizing switch in error may cause a tripping and loss of load. Any operating man can see other possibilities for error in this arrangement, especially in time of emergency.

Fig. 6 shows a complete layout of the bus and associated oil circuit breaker controls embodying the recommended new type indicating device. Again, in comparison with that shown in Fig. 5, the simplicity of this layout is apparent. My secretary, upon seeing these diagrams, said the new layout was "streamlined." And so it is—streamlined for an accurate visual check of the switching job at hand. On this diagram there is also indicated the possibility of bringing into play the principle of *form* by, for example, surrounding each sectionalizing and bus-tie switch with, let us say, a triangular or circular device to contrast with other switches on the board.

New Control Switch

A preliminary sketch of a device for the indication and operation of an oil circuit breaker in accordance with proposals made in this paper is shown in Fig. 7.

Another advantage of this device is that the control switch can be used to "try out" a switching job, without actually doing it. If, for example, the operator was about to close an oil circuit breaker on one of the lines now open, he could turn the hollow-shaped handle, now colored green, to a position in line with the diagram outline. Then, looking over his board, he can check to make sure that the operation is the correct one to perform. When he is satisfied that it is, he then pulls the T-shaped handle, just as he would the familiar pull-button switch, and the oil circuit breaker operates. The indicating light in the stem of the handle changes from *green* to *red*, while the position of the bar turns from *right angles to the bus to one in line with it*. The operator leaves the handle in the position to show a continuous red line to the bus.

An important feature of this device is that it provides a visual check on the oil circuit breakers so that the effect of the most complex switching operation can be seen readily by the operator. His attention is attracted by the red bar in line with the bus and the green bar at right angles to it. These give him direction as well as color and become associated with the oil circuit breaker positions. His attention is further stimulated by the "try-out" principle, which, in addition, allows him to check the complete operation without actually doing it. This feature will be discussed further later.

Visual Aids in Avoiding Danger

In the illustrations use has been made of a mimic bus. I understand that, although these are not used to any extent on the Philadelphia Electric Company System, mimic buses are used widely on other systems. In passing, it may be of interest to note that, from the viewpoint of the human machine, there seems real justification in employing the mimic bus as an aid to the operator in "sizing up" the situation. Experiments show that attention remains better adjusted if the different parts of the object attended to are related to each other in such a way that attention may skip from one part to another easily. This *unity* may be achieved by a set-up, such as that represented by a mimic bus, in which all the parts of the bus form a general design that has meaning and significance to the operator.

Accommodation of Attention

Two or three other factors deserve consideration in substation design. One of these is technically known as *accommodation of attention*. This term means that if a person is prepared for an event before it occurs, he will receive a more complete and detailed impression of it and will respond more quickly and more accurately to this impression.

It is interesting to note that, without perhaps a formal recognition of this principle of accommodation of attention, engineers have actually taken advantage of it in the design and construction of substations. This appears, for example, in the requirement, built into equipment, that the operator manipulate a control switch, such as certain types of lever switches, before proceeding with the main operation. This preliminary or "setting" operation definitely tends to attract attention toward the main operation to be performed and to hold attention on that operation while it is being performed.

The findings of the psychological laboratory favor a wide extension of this procedure. Such findings may be applied in substation design by utilizing the preliminary operations to indicate exactly the nature or direction of the major operation which is to follow immediately. This has been done in preparing the device illustrated in Fig. 7, where the preliminary operation of the control switch (T-shaped handle) helps to direct and hold the attention of the operator on the next operation by indicating exactly what will happen when it is performed.

Motion, Discontinuity

Both everyday observation and experimental studies in the laboratory show that *motion* is a potent factor in attracting attention. Attention is

[*Continued on page 137*]

Expulsion Tubes Decrease Wood Line Tripouts

To improve lightning protection on a 110-kv. line, partly of wood and partly of steel construction, tubes were installed as of less cost than ground wires — Experience indicates better performance of tubes on wood than on steel structures

F. H. MEECE,* *Engineer Transmission Department, Carolina Power & Light Company, Raleigh*

STUDY OF THE operating record of a 110-kv. line fully equipped with expulsion tubes indicates that they have been highly effective in reducing line tripouts due to flashover on the wood H-frame portion of the line, but leave some room for improvement in the accomplishment of this objective on the steel tower portion of the line. Damage to insulators and fittings due to flashover on the steel tower line has been greatly reduced, however. It is believed that completion of the installation of armor rods will practically eliminate conductor burning.

The major portion of short-interval transmission line outages is due to insulation failures caused by lightning. Many methods of reducing these outages have been used with varying degrees of success. The two methods that are the most prominent today are: (1) overhead ground wires, and (2) expulsion tubes. Overhead ground wires prevent lightning surges from contacting the line conductors, while expulsion tubes discharge the lightning surges from the line conductors without an interruption to service.

* Condensation of paper presented at recent meeting of Southeastern Electric Exchange, engineering and operation section, Raleigh, N. C.

Overhead ground wires are very effective in reducing outages caused by lightning, but may not be feasible economically. To adapt overhead ground wires to existing lines it is often necessary to redesign the structures to accommodate the ground wires, and it may also be necessary to install a counterpoise to reduce structure footing resistance.

Installation of expulsion tubes may be cheaper than overhead ground wires. The choice between overhead ground wires and expulsion tubes for the protection of a particular line will usually be determined by the cost of installation, the cost of maintenance and the degree of protection desired.

Carolina Power & Light Company has 26.3 miles of single-circuit steel tower line and 17.8 miles of wood H-frame line (Fig. 1) operating at a voltage of 110 kv., fully equipped with expulsion protective gaps. This is the Carolina Power & Light Company-owned part of the Laurinburg-Wilmington line which extends from Laurinburg to Abbotsburg, a distance of 44.1 miles. This section of the line is composed of a steel tower line from Laurinburg to Lumberton and the Lumberton-Abbotsburg wood H-frame line.

The steel tower line from Laurinburg to Lumberton was built in 1912 and now has seven Hewlett units for suspension and eight Hewlett units for dead end towers; the conductor is No. 2/0 ACSR. The expulsion tubes were installed in 1934.

Since a large proportion of the Tide Water Power Company load was to be supplied over the Laurinburg-Wilmington line it was considered necessary to make the line as near lightning-proof as practicable economically, in order to obtain a high degree of operating reliability on both the existing and the new lines. Overhead ground wires were considered, but to make this form of protection effective a counterpoise system of grounding would have been required.

Physical Details of Line

In addition to an expensive counterpoise system, the existing tower line would have required one additional overhead ground wire. These ground wires, to be effective, would have necessitated an extension to the towers to obtain a greater distance between the power conductors and the ground wires. With increased tower heights for this purpose, wind loading would have been materially increased on the towers and, due to their relatively low strengths, tower failure might have resulted. The new wood H-frame line would have required longer poles to support overhead ground wires, as well as additional hardware. After careful consideration of these facts, the expulsion protective gaps were chosen to protect this line because it was be-

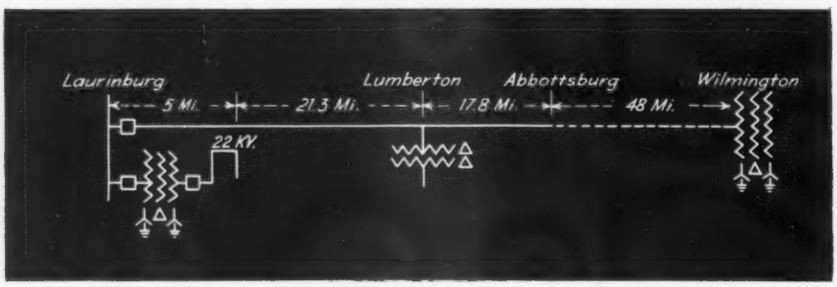
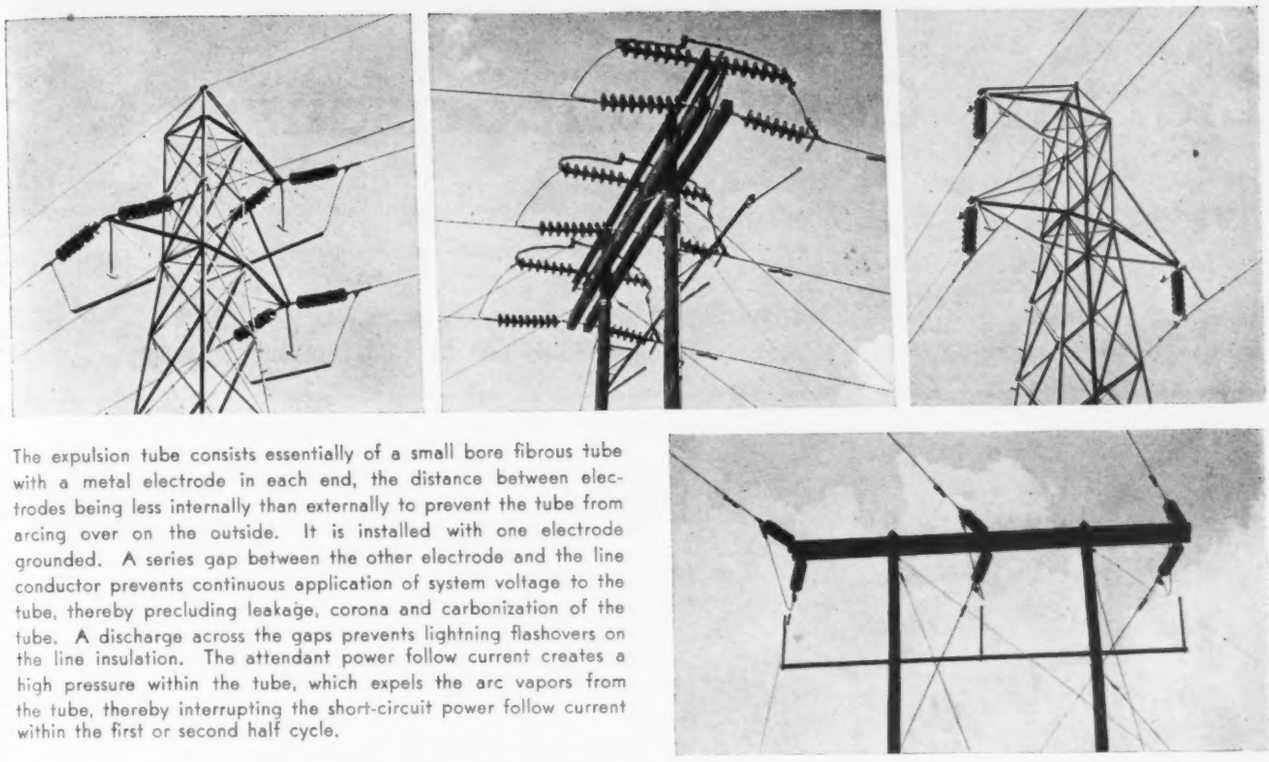


Fig. 1—Line protected with expulsion tubes

110-kv. line from Laurinburg to Abbotsburg owned by Carolina Power & Light Company and thence to Wilmington by Tidewater Power Company



The expulsion tube consists essentially of a small bore fibrous tube with a metal electrode in each end, the distance between electrodes being less internally than externally to prevent the tube from arcing over on the outside. It is installed with one electrode grounded. A series gap between the other electrode and the line conductor prevents continuous application of system voltage to the tube, thereby precluding leakage, corona and carbonization of the tube. A discharge across the gaps prevents lightning flashovers on the line insulation. The attendant power follow current creates a high pressure within the tube, which expels the arc vapors from the tube, thereby interrupting the short-circuit power follow current within the first or second half cycle.

Fig. 2—Various forms of 110-kv. structures provided with expulsion tubes

lieved they would give reliable protection to the line and could be installed more economically.

The Laurinburg-Lumberton section of this line consists of 44 double-circuit steel towers and 172 single-circuit steel towers, all of the same type except that the single-circuit towers are shorter and have only three conductor positions. The double-circuit towers support a 22-kv. line on the north side in addition to the Laurinburg-Lumberton 110-kv. line. Both the double-circuit and single-circuit towers have one overhead ground wire of $\frac{3}{8}$-in. stranded steel supported at the center of the tower and about 8 ft. above the top conductor for the single-circuit and 10 ft. above the top conductor for the double-circuit towers. The line conductors are No. 2/0 ACSR with a vertical spacing of 9 ft. and a horizontal distance of 15 ft. between circuits. The structure ground resistances are the resistances of the tower footings. No counterpoise system or auxiliary grounds have been installed. No data are available on the ground resistances of the tower footings for this section of line, but it is assumed that the tower footing resistances are higher for the average value than the pole ground wire resistances of the wood H-frame structures on the new line due to the effect of guy wires in lowering the ground resistances of the ground wires on the wood pole structures.

The Lumberton-Abbotsburg section of this line consists of 155 single-circuit wood H-frame structures without overhead ground wires or extensive counterpoise system. The conductors are No. 4/0 ACSR with 12.5 ft. horizontal spacing. Insulation is six standard 10-in. units for suspension and seven standard 10-in. units for strain structures. Each pole has a ground wire of No. 4 galvanized steel which extends a few inches above the pole top. This ground wire is brought down the pole, passed under the bottom end and wrapped eight times around the lower end of the pole. Each turn is fastened with a staple where it crosses the vertical wire and the vertical wire is stapled.

All of the pole grounds except five measured between 2 and 260 ohms resistance. The resistances of these five grounds were reduced to a value below 300 ohms by driving a ground rod about 3 ft. from each pole and connecting these auxiliary grounds to both pole ground wires. Except at these five structures the pole grounds are interconnected only through the steel crossarm used for mounting the expulsion tubes, but the resistances were found to be the same for the two pole grounds at all the structures. These resistance values are believed to be very nearly maximum since the tests were made during dry weather.

Expulsion Protective Gaps

On the steel tower section of this line the expulsion tubes are attached to a counterweighted arm which is fastened to the top of the insulator string by a special fitting. The tube hangs downward from the end of this arm, making an angle of about 30 deg. with the vertical, forming a gap between the end of the tube and the conductor at a point about 2 ft. from the center of the insulator string. The external gap setting for this section of the line is 11 in.

[*Continued on page 120*]

Circuit Breaker Operations at Source End

	1934	1935	1936	1937	1938 (8 mos.)
Total operations	15	5	8	13	7
Total outage time (minutes, seconds)	1:30	0:13	0:13	0:56	0:18
Good after instantaneous reclosure	8	3	6	5	4
Aggregate outage time (minutes, seconds)	0:04	0:02	0:03	0:02½	0:02
Operations requiring two reclosures	3	2	2	7	3
Aggregate outage time (minutes, seconds)	0:26	0:11	0:10	0:38½	0:16
Operations requiring three reclosures*	4			1	
Aggregate outage time (minutes, seconds)	1:00			0:15	

*Two automatic, one manual.

Lighting Cost Comparisons

Simple method for determining relative costs of light sources under differing conditions

HOWARD M. SHARP, *Manager, and* **J. F. PARSONS**, *Engineering Supervisor*
Lighting Bureau, Buffalo, Niagara & Eastern Power Corporation, Buffalo, N. Y.

THE RAPID DEVELOPMENT of commercial types of light sources has introduced additional complexities in the design of lighting systems to meet particular conditions. In addition to careful analysis of the nature of the seeing task, the direction and quality of the illumination and the distribution of brightness, among other things, there should be in many instances a careful study of the comparative costs of providing the correct illumination by any one of a number of suitable illuminants. Each case requires individual analysis, but it is helpful if the lighting salesman has available for preliminary and general discussion easily understood and graphic data as to relative ownership and operating costs.

A number of such studies were made in this organization, based upon actual areas and contemplated installations. All comparisons were reduced to the rates at which electrical energy might be purchased. Further, to simplify, every light source investigated was compared with the one most familiar, namely, incandescent. From this it was a simple matter to prepare graphs, the abscissa of which represented energy rates and the ordinates, the relative cost of the light source in question in per cent of incandescent. Figs. 1 and 2 present such data for a number of lighting applications using equipment in general use. As pointed out above, these represent actual field studies. However, the method by which they were developed can be applied theoretically to any lighting problem, so that a great number of curves could be developed for use in any locality.

The data required and the steps by which they are co-ordinated are given in the table. This recognizes that the cost of artificial illumination in commercial and industrial establishments is made up of non-operating overhead, consisting of depreciation (or obsolescence), interest, taxes, insurance and maintenance, and of operating cost, consisting of lamp renewals and electrical energy. It is not sufficient to consider the relative luminous efficiencies of bare light sources. The equipment necessary to make these sources adaptable for every-day use must also be included. In a competitive market these factors are often neglected, but it is the duty of the illuminating engineer to make them clear to the prospective purchaser.

The inclusion of maintenance under non-operating or ownership costs needs clarification. This is taken to mean repairs on the wiring system, luminaires, cleaning, etc., which would be occasioned by the hazards of the location and which, to a large degree, would be independent of the hours of use. In a specific analysis, this item should be discussed with the accountants of the customer in order to reflect their financial practice, because it might be their custom to include this as an operating expense. Another figure which should be obtained from the customer for whom the analysis is made is that to be used in items 10 and 11. Our experience has been that these are average and conservative and quite safe for preliminary discussion, but in order to comply with individual

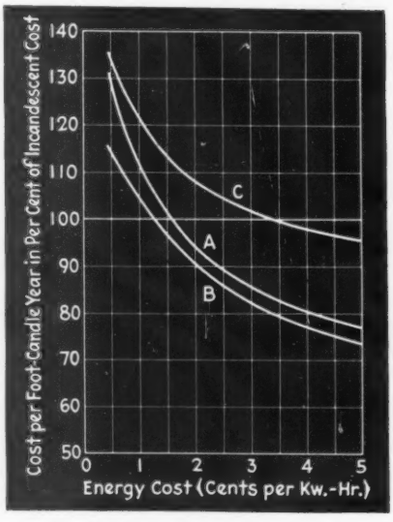


Fig. 1—High-intensity mercury-vapor compared to incandescent at various energy rates

Curve A—Providing general illumination in an industrial interior with "Glassteel" diffusers, employing one 400-watt high-intensity mercury lamp, compared with one 750-watt general service incandescent lamp. Area 200 x 100 ft. with 12-ft. mounting height above working plane, which is 36 in. above the floor. Utilization coefficient 0.59. Same number of outlets for each system. Equipment operating 2,000 hours per year. Wiring cost, from electrical contractor's estimate on actual job, includes branch circuits, panels, feeders and installation of lighting equipment.

Curve B—Providing general illumination in an industrial interior with prismatic semi-concentrating type reflectors, employing one 400-watt high-intensity mercury lamp, compared with one 750-watt general service incandescent lamp. Area 200 x 100 ft. with 18-ft. mounting height above working plane, which is 36 in. above the floor. Utilization coefficient 0.65. Same number of outlets for each system. Equipment operating 2,000 hours per year. Wiring cost, from electrical contractor's estimate on an actual job, includes branch circuits, panels, feeders and installation of lighting equipment.

Curve C—Providing general illumination in an industrial interior with "Glassteel" diffusers employing one 400-watt high-intensity mercury plus three 150-watt incandescent lamps, compared with one 1,000-watt general service incandescent lamp. Area 200 x 100 ft. with 12-ft. mounting height above working plane, which is 36 in. above the floor. Utilization coefficient 0.59. Same number of outlets for each system. Equipment operating 2,000 hours per year. Wiring costs, from electrical contractor's estimate on an actual job, includes branch circuits, panels, feeders and installation of lighting equipment.

EXAMPLE

Problem—To obtain the cost per foot-candle year of two light sources, one of which is incandescent, for an installation providing general illumination in an industrial interior with Glassteel Diffusers. Computed for various energy rates on a per outlet basis with an annual operation of 2,000 hours.

Computations		Source A	Source B*
1. Source		Incandescent	
2. Hours of life		1,000	
3. Initial lumen output		14,550	
4. Average lumen output throughout life		13,120	
5. Lamp cost, net		$2.66	
6. Luminaire cost, net		$12.06	
7. Auxiliary equipment cost, net		0	
8. Wiring cost†		$32.60	
9. Investment in equipment (Items 6, 7, and 8)		$44.66	
10. Interest, taxes and insurance (10 per cent of Item 9)		$4.47	
11. Depreciation and maintenance (15 per cent of Item 9)		$6.71	
12. Non-operating overhead (Items 10 and 11)		$11.18	
13. Burning hours per year		2,000	
14. Annual lamp renewal cost		$5.32	
15. Annual labor cost for lamp replacement		0	
16. Total lamp renewal and overhead (Items 12 and 14)		$16.50	
17. Wattage of lamp and auxiliary		750	
18. Annual energy cost	Cents per Kw.-Hr.		
	½	$7.50	
	1	15.00	
	2	30.00	
	3	45.00	
	4	60.00	
	5	75.00	
19. Total cost per year	½	24.00	
	1	31.50	
	2	46.50	
	3	61.50	
	4	76.50	
	5	91.50	
20. Cost per foot-candle-year = Item 19 / Item 8 × Utilization Coef.‡	½	0.0310	
	1	0.0407	
	2	0.0600	
	3	0.0795	
	4	0.0988	
	5	0.1180	
21. Cost per foot-candle-year in per cent of incandescent cost	½	100%	
	1	100%	
	2	100%	
	3	100%	
	4	100%	
	5	100%	

* Make similar calculations for any light source it is desired to compare with incandescent, using proper figures.

† From electrical contractor's estimate; includes in new work branch circuits, panels, feeders and installation of lighting equipment. Remodeling or simple changes may include fewer items.

‡ Area 200x100 ft. with 12-ft. mounting height above the working plane, which is 36 in. above the floor. From the "Illumination Design Data" book unit No. 6, with incandescent light source, the coefficient of utilization is 0.59. E.T.L. curves for "Glassteel" diffusers show same distribution and over-all efficiencies for any commercially available light source applicable to such a luminaire. The utilization coefficient is therefore the same regardless of light source.

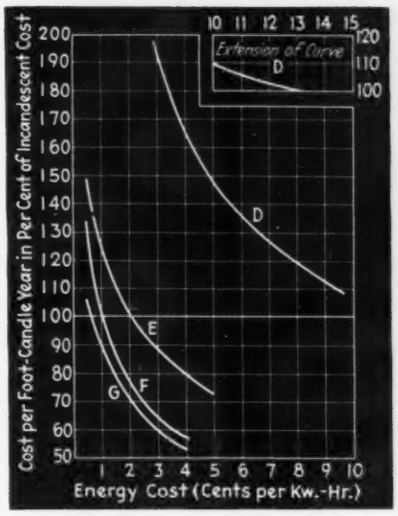


Fig. 2—Fluorescent compared to incandescent at various energy rates

Curve D—Providing general illumination in a commercial interior with 18-in. diameter white glass enclosing globes with ceiling fitters and 300-watt incandescent lamps, compared with 20-watt daylight fluorescent lamps mounted bare in chrome-plated ceiling units with seven lamps per unit. Area 30 x 20 ft. with 10-ft., 6-in. ceiling. Working plane 42 in. above the floor. Utilization coefficients: Enclosing globes 0.37; bare fluorescent 0.46. Same number of outlets for each system. Equipment operating 2,000 hours per year. Wiring cost includes only installation of equipment. Branch circuits and other wiring were assumed to exist.

Curve E—Providing show case illumination with five 60-watt inside frost incandescent lumilines, compared with four 20-watt daylight fluorescent lamps in continuous trough reflectors. Lumens produced by light sources and resultant foot-candles in showcase assumed equal for both types of source. Published data show about 3 per cent more lumens from the fluorescent source. Equipment operating 2,000 hours per year. Wiring cost includes only installation of equipment in case. Branch circuits and other wiring were assumed to exist.

Curve F—Providing general illumination of tinted light from a cove employing 30-watt pink fluorescent lamps, compared with 40-watt old rose inside colored incandescent lamps. Area is a night club 25 x 60 ft. with a 14-ft. ceiling. Lamps are mounted bare on "Curtistrip" in a wide wooden cove 24 in. below the ceiling surface, extending around four sides of the room. Fluorescent lamps spaced end to end; incandescent 11 in. on centers. Initial lumens of old rose lamp 220. Utilization coefficient 0.17. Equal foot-candles are provided by the two systems. Equipment operating 2,000 hours per year. Wiring cost includes branch circuit wiring only. Panels and feeders were assumed to exist.

Curve G—Providing bank counter illumination with one 30-watt daylight fluorescent lamp in an open trough, compared with three 60-watt incandescent lamps in a 36-in. prismatic lens trough, one over each wicket at a mounting height of 4 ft. above the counter. Equal foot-candles are provided by the two systems. Equipment operating 2,000 hours per year. Branch circuit wiring along tops of cages, assumed to exist, 220 volts for fluorescent lamps made available by proper reconnection of branch circuit at the panel.

Table of Computations for Arriving at Comparative Costs

1. Source.
2. Hours of life.
3. Initial lumen output.
4. Average lumen output throughout life.*
5. Lamp cost.
6. Luminaire cost.
7. Auxiliary equipment cost.
8. Wiring cost.
9. Investment in equipment (sum of 6, 7 and 8).
10. Interest, taxes and insurance (10%† of Item 9).
11. Depreciation and maintenance (15%† of Item 9).
12. Non-operating overhead (Item 10 plus 11).
13. Burning hours per year.
14. Annual lamp renewal cost.
15. Annual labor cost for lamp replacement.‡
16. Total lamp cost and overhead (Item 12 plus 14 plus 15).
17. Wattage of lamp and auxiliary.
18. Annual energy cost.
19. Total cost per year (Item 16 plus 18).
20. Cost per footcandle year = Item 19 / Item 4 × Utilization coef.
21. Cost per foot-candle year in per cent of incandescent cost.

* This value enters the analysis as explained under (20). It appears in the lamp manufacturers' published data as "Lumens at 70 per cent of Life" and should be used where available. In cases where the value has not been published "Initial lumen output" (3) for each of the light sources being compared may be used, thus tacitly assuming the same rate of depreciation for both sources.

† The percentages of capital cost taken to determine non-operating overhead will vary, depending upon the basis on which these items are set up by the management. The figures of 10 per cent and 15 per cent for Items 10 and 11 are believed to represent a fair average of good practice.

‡ To be used where available. It seems customary to allocate a definite charge to this item only in the case of a very few industrial plants. It has not been entered in the cases presented here.

corporate practice, and to give proper weight to equipments which represent transient steps in the development of a product, it is wise to consider these percentages as fluid, not fixed.

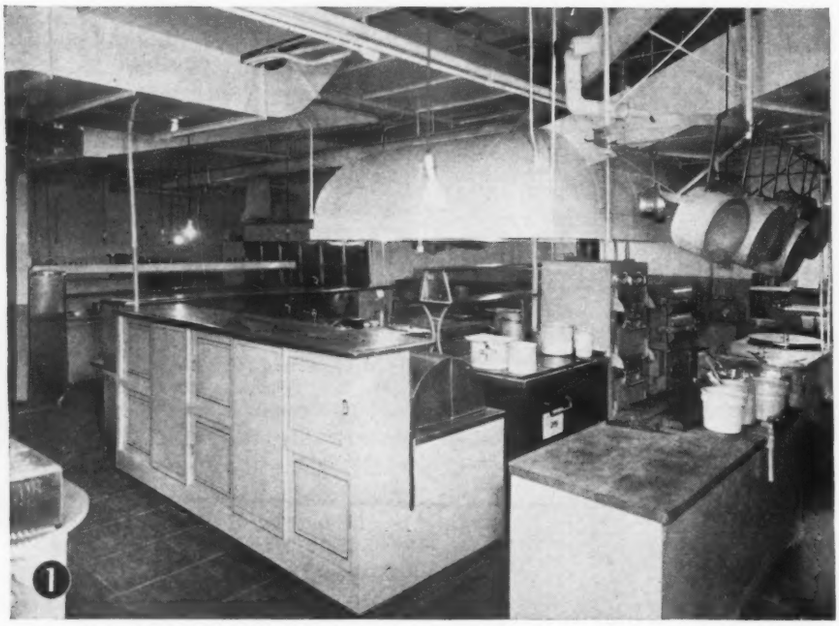
It is recognized that a cost analysis developed according to this procedure needs an additional step before it can be said that a complete economic analysis of lighting, as opposed to light, has been made. This step has to do with the relationship between lighting and the entire production or commercial process of which lighting is only a part. We would refer, for example, to the relationship between lighting and air conditioning, local heating, or the influence of color or brightness distribution upon a production or selling problem. These involve many complex factors, many of which are still obscure, but recognition of their existence may speed the day of more complete knowledge.

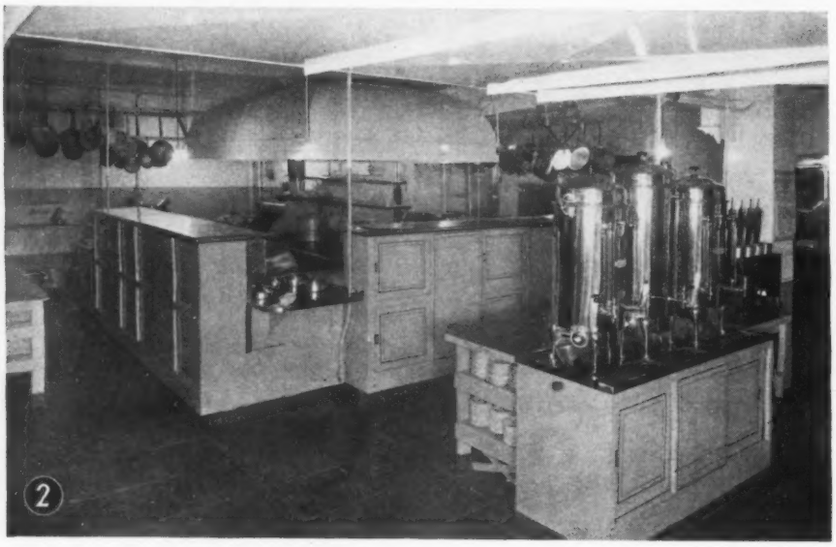
The use of the curves in Figs. 1 and 2, and others similarly prepared, will help to give the consumer a solution to lighting problems that is in his best interest.

Commercial Selling Converts Hotel

Kitchen heating totals 148 kw.—New applications exceed isolated plant capacity — Managing director of hotel states nine advantages of electrified kitchen in addition to lower cost of operation

DESKIN O. BERGEY, *Northwestern Electric Company, Portland, Ore.*





Modernized hotel kitchen boasts 148 kw.

Fig. 1—Two toasters at left take 5 kw.; two Lang ranges take 50 kw.; two stock pots at work table 18 kw.; warmers in center good for 14 kw.; pressure cooker, 12 kw., and three-deck roasting oven 11 kw. Fig. 2—In addition, at right center are refrigeration boxes and 15 kw. in coffee urn assembly, egg boiler and cup warmer.

CONCRETE EVIDENCE of the success of a long-time commercial program is the extremely modern electrical job at the Hotel Benson, Portland, Ore. Installed was a kitchen whose sole source of heat (with the exception of one charcoal broiler) is electricity; an electrically refrigerated water-cooling system, which circulates cold water to all rooms, and an electric steam generator for the valet equipment. In addition the hotel air conditioned its Oak and Crystal dining rooms and replaced its heating and generating plant, consisting of two 250-hp. boilers, one 150-kw. generator and two 75-kw. generators, with Northwestern Electric Company's central heating service, power service and hot-water supply service.

The kitchen is, from every angle, the high spot of the job. Equipment includes one 47-in. one-oven range and one 88-in. one-oven range, one 60-gal. two-section stock kettle, one two-deck electric steam pressure cooker (the only one on the Pacific Coast), two electric fry kettles, one three-deck roasting oven, one three-deck pastry oven, one electric candy kettle, one four-basket egg boiler, two four-slice toasters, two coffee urns and one boiler. Serving equipment includes one 12-ft. hot food table and plate warmer for a la carte service, one 10-ft. hot food table and plate warmer for banquet service, one coffee cup warmer and two two-section roll warmers. Miscellaneous equipment includes dish and glass washers, mixers, slicers, grinders, vegetable parers and ice cutter.

Replacing the old 40-hp. ammonia plants is a new four-compressor electric unit furnishing refrigeration for four large walk-in storage

boxes, one low-temperature sharp room, one ten-cabinet pantry box, one ice-cube storage cabinet and ice cream cabinets.

A tabulation of the number of meals served and the kilowatt-hour consumption for twelve months shows that 194,213 kw.-hr. were used in the preparation and serving of 159,509 meals. Broken down by months, the figures are as follows:

	Kw.-Hr. Usage *Kitchen Equipment	Number of Meals Served
March	8,320	15,165
April	10,128	14,935
May	12,798	12,040
June	14,290	13,075
July	15,936	16,112
August	16,956	17,184
September	15,744	11,255
October	16,830	12,093
November	15,912	11,395
December	16,210	6,423
January	17,104	8,217
February	16,164	10,824
March	17,821	10,791
Total	194,213	159,509

*Connected load 148 kw. heating equipment.

Air conditioning of the Benson's dining and banquet rooms is done through a 20-ton compressor. By means of automatic control, temperature is maintained at approximately a 10-deg. variation to outside temperature. Air is completely changed every five minutes, which means that almost 12,000 cu.ft. of air is drawn in from the outside every minute for treatment and circulation.

This 20-hp. conditioning equipment is slightly more than necessary, because it was found that when the hotel's steam plant was removed considerable heat was removed from the Crystal dining room. However, this extra cooling capacity is available for additional air conditioning with but little expense to the hotel.

Prior to the modernization program, peak demand on the hotel power generating station was 187 kw. Northwestern Electric furnished a small part of any additional demand. Now, however, the hotel's electric demand is about 300 kw., all of which is supplied from Northwestern's distribution system.

How much of the load added at Hotel Benson can be credited to the promotion of electric cookery, in which the Northwest has pioneered, is a matter of conjecture. It is perhaps significant that the job was sold, against competitive equipment, within a year after Northwest companies had overhauled their commercial sales technique through the medium of the Northwest Electric Light & Power Association.

Isolated plant inadequate for load

Fig. 3—Ice cream cabinet, electric mixer, an 11-kw. bakeoven are part of kitchen load, plus a 5-kw. candy kettle not shown. Fig. 4—Dish washer and glass washer shown here, supplemented by slicers, grinders, vegetable parers, ice cutter, etc.

The commercial cooking committee of the association's commercial and industrial sales bureau began in 1936 to assemble data on commercial cooking and to set up forms to expedite the exchange of information among companies and between utilities and manufacturers. Customers' requirements, load characteristics of commercial equipment and the nature of competitive equipment were subjects for succeeding studies. Standard "commercial and industrial data sheets" were set up in an effort to make the experience of one system in the group conveniently available to the commercial salesmen in all the other systems of the group. In such evidence the utility salesman found both the clue to new prospects and the testimony which often has a deciding factor in converting an old prospect to a customer.

That the Hotel Benson is now a satisfied customer is proved in a letter sent by W. E. Boyd, managing director of the hotel, to the Northwestern Electric Company soon after the installation was completed. "Through the use of electric heat," he said, "we have reduced our kitchen fuel bill approximately $900 per year."

He also listed nine additional advantages which might well be used by utility commercial salesmen: (1) Cool kitchen, (2) less meat shrinkage, (3) improved pastries, (4) positive raw-food storage, (5) positive prepared-food storage, (6) quiet operation, (7) sanitation, (8) reduced fire hazard and (9) reduced maintenance.

Such benefits go a long way toward making the Hotel Benson one of the most modern hotels in the Northwest.

Watch Water Heater Loading on Distribution Transformers

Peaks caused by water heaters can be avoided by proper balance with range load — Large storage heaters more desirable from transformer loading standpoint than smaller capacity units with top element "floating"

A. G. PERGANDE, *Distribution Engineer Wisconsin Electric Power Company, Milwaukee, Wis.**

EXPANSION of off-peak water heater business on a profitable basis is dependent on control of that expansion to avoid distribution transformer overloading and consequent necessity for increased investment in distribution transformer capacity. A study by the Wisconsin Electric Power Company of water heater and range loading on ten transformers shows in many cases maximum demands on transformers being created by "off-peak" water heater loads. It is concluded from the study that a proper balance between ranges and water heaters (at least an average of two to one on a transformer) must be maintained to avoid peak demands caused by water heaters. The study discloses that the "floating" of upper elements in water heaters is frequently responsible for night peaks on transformers and should not be encouraged, but, instead, heaters of larger storage capacity should be used. Also the interlocking of upper and lower elements to prevent simultaneous connection will definitely reduce the possible demands on transformers during the heater charging period. "Interlocks" on all heaters, and especially on the 120- and 160-gal. sizes, are recommended.

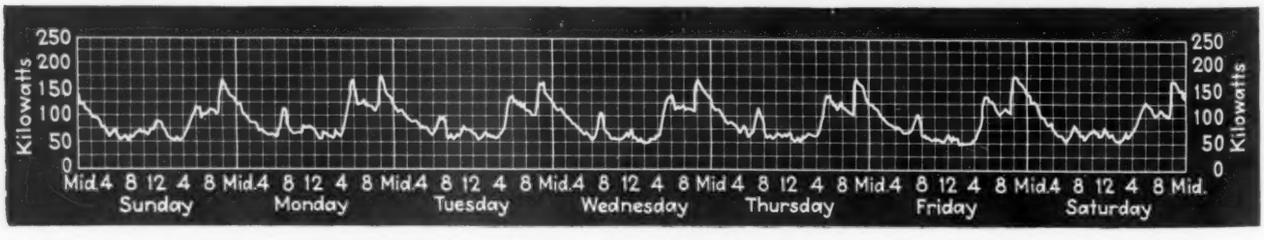
Recording demand meters were installed on ten transformers serving loads that included ranges and off-peak water heaters in various numbers and ratios. Records were obtained during the winter of 1937–38; the ten curves of individual transformer loads totaled in the accompanying graph being for various weeks in December, January and February. Data for the different locations appear in the table. The column "heater gallons" is included in the table because the heaters are not all the same size, and, consequently, the total gallons figure is more nearly indicative of the demand than is the number of heaters.

Range peaks on distribution transformers in the Milwaukee area ordinarily occur at about 6 p.m. On all ten of the transformers studied this peak exceeds the lighting peak, occurring two hours later. However, the range peak is short and its heating effect on the transformer is not severe. But this is not the case with the water heater peak, exceeding the lighting peak in all except the one case of 7 per cent saturation (location 6 in the table), which maintains itself for a considerably longer time with consequently greater danger of damage to transformers inadequate in size.

In six of the ten cases studied the water heater peak at 10 p.m. or later was greater than that of the range. The composite load curve for the ten transformers, shown here, exhibits a range peak of 165 kw. and a water heater top of 177 and the ratio of ranges to water heaters is 1.17 to 1. Indications from the ten individual curves are that the range peak will go above the water heater peak in the average case if the ratio is 1.75 to 1. However, indiscriminate use of such a closely figured ratio would be dangerous, and it is felt that the 2 to 1 ratio put forward by other investigators is much better.

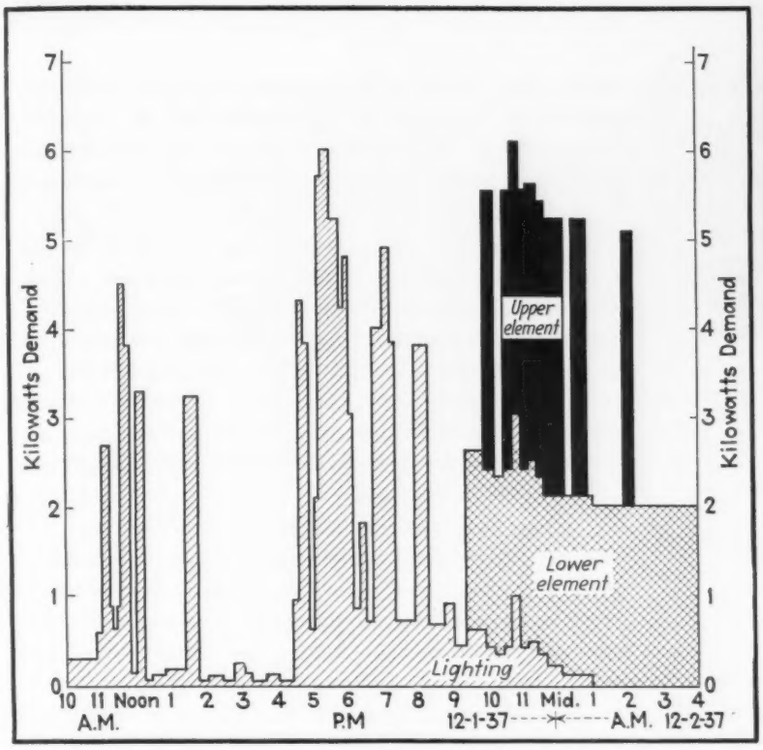
Water heaters vary in size and the demand created by their lower elements is proportional to their size. Therefore, water heating load on a transformer might be more accurately

*Adapted from paper "Transformer Loading as Affected by Domestic Electric Water Heaters and Off-Peak Storage Type Water Heaters," to Wisconsin Utilities Association.



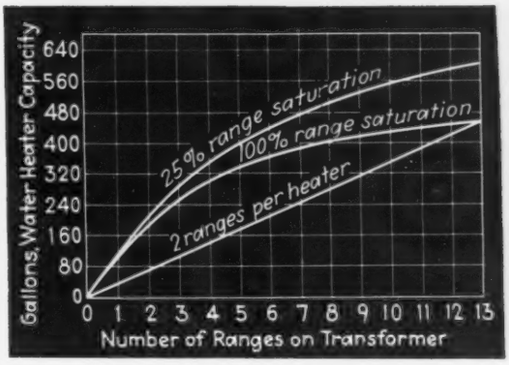
Water heater load effect on ten distribution transformers show daily overloads

This is a composite of load curves of ten transformers; data obtained in December, 1937, and in January and February, 1938. All except one of the individual load curves included in the composite show overloads caused by water heaters every day of the record, overloads not excessive on the average, but in one case going as high as 100 per cent in the fifteen-minute interval measured. The numbers and saturations of major appliances at the time of the study among the 187 customers covered was ranges, 54 and 29 per cent; water heaters, 46 and 25; refrigerators, 153 and 82; roasters, 88 and 47; ironers, 37 and 20.



"Floating" top element boosts water heater peak

This is the actual case of a typical full-use customer. It shows that the water heater with top element "floating"—that is, only thermostatically controlled—has small claim to classification as an off-peak load on the distribution transformer.



Safe balance between ranges and water heaters

This graph shows the amount of water heating in gallons that can be connected to a transformer without causing the water heater load peak to exceed that of the range. The straight line of two ranges per water heater is based on a heater of 70 gal. capacity, which is the average of all on the Wisconsin Electric Power System.

measured in gallons than in number of heaters. This was done in preparing the second graph, which shows the amount of water heating which can be connected to a transformer without exceeding the range peak. The theoretical curves for 25 and 100 per cent range saturation are based on the assumption that the water heating load may equal the entire range load plus the small decrease in the lighting load between 6 and 9:30 p.m. The curves flatten out as the number of ranges increases, because the diversity between the ranges increases with number, whereas there is no diversity between the lower elements of the heaters. This graph indicates that the ratio of two ranges to one water heater is only something to go along with in present conditions and will have to be revised upward if and when range saturation becomes really impressive.

Note that the straight line of the ratio intersects the 100 per cent saturation curve with only thirteen ranges on the transformer and would intersect the curves of lower saturation at higher numbers of ranges. This means that as range saturation rises significantly among groups of more than a dozen or so customers served from one transformer the proportion of water heaters must be decreased if the water heater peak is not to exceed that of the range. But for the present the 2 to 1 ratio is undoubtedly safe and will be for a considerable time to come; also, it allows some latitude for "floating" of top heater elements and for other usual night loads.

When a customer elects to "float" the upper heater element on the line it cuts in quite often after the lower element is energized. For example, the accompanying actual load chart of a "full-use" customer shows the upper element cutting in four times after 9:30 p.m. In some designs of heaters the heating of the water at the bottom of the tank by the lower element causes enough circulation of cold water near the upper thermostat to cut the upper element into operation (if floating), even though no water is drawn from the tank.

Floating Upper Element

Of the 46 water heater customers covered in the field surveys, nine habitually float the upper elements, twelve keep them under manual control and cut them in occasionally and 25 report that they never use them. Of the nine customers floating the upper elements, four are grouped on one transformer which in the study showed high peak demands after 11 p.m. as the result of these upper elements cutting in while the lower elements were operating. It is much better to have a customer use an 80-gal. heater and operate only the lower element than a 50-gal. heater and let the upper element "float." In the first case the heater load is 2,000 watts, while in the latter it may be 3,750 watts, an increase of 87.5 per cent.

The part of the water heater peak produced by the simultaneous operation of upper and lower elements is reduced by interlocking, so that the lower element is cut out when the

[*Continued on page 136*]

Basic Data in Milwaukee Study of Transformer Loads

Location	No. of Cust.	No. of Ranges	Range Satur.	No. of Water Heaters	Heater Satur.	Heater Gal.	Kw. Peak Demand	Time of Peak
1	7	3	43%	5	71%	370	17.3	10:00 p.m.
2	20	6	30%	7	35%	580	29.5	11:30 p.m.
3	12	5	42%	2	17%	130	16.6	6:45 p.m.
4	14	6	43%	4	29%	290	16.6	10:15 p.m.
5	11	4	36%	6	55%	420	19.4	10:30 p.m.
6	27	5	19%	2	7%	100	27.6	6:30 p.m.
7	39	7	18%	7	18%	500	28.8	10:30 p.m.
8	10	2	20%	4	40%	260	12.4	10:00 p.m.
9	25	9	36%	5	20%	370	22.0	5:45 p.m.
10	22	7	32%	4	18%	260	19.5	6:00 p.m.
Combined	187	54	29%	46	25%	3280	177	10:15 p.m.

Editorials

S. B. WILLIAMS, *Editor*

TVA Whitewashed

TVA has been whitewashed. The majority report of the Congressional investigating committee finds nothing wrong with the Authority. Its rates "provide a legitimate, honest yardstick of equitable rates of private industry," although the minority finds the yardstick "misleading, deceptive, unfair and dishonest as a measure of the fairness of the rates of privately owned utilities not enjoying the subsidies and advantages of which TVA may avail itself."

The report will probably make little impression on anybody, for it is about what was expected after one of the greatest Congressional investigating farces ever held. The majority of the committee had no heart for the job and openly showed it. The committee's counsel appeared in the rôle of attorney for the agency under investigation. Had it not been for the minority members even the little that was brought out would never have seen daylight.

Perhaps some consolation can be taken from the thoroughness of the whitewash. The TVA was held to be so pure that the report is bound to be discredited as a piece of political defense. Or, as Shakespeare said, "The lady doth protest too much, methinks."

Benefits from Planned Mechanization

WITH A FEW notable exceptions, use of mechanized equipment has not been a matter of programmed planning on the part of utilities in viewing their construction and maintenance activities. This has been the case largely because the utilities felt their operations were unique and substantially different from those of construction firms which build bridges and dams, excavate pits and tunnels and erect large structures of all sorts. By contrast, the power companies run long, slender trenches, set poles over scattered territory and erect transmission structures in often difficult terrain. Smaller mechanized tools have been common adoptions, but the heavier equipments seemed for long just not to fit, at least not well enough to justify a planned and broadly co-ordinated engagement in such devices.

Actually, however, the facts disprove the sentiment. A nation-wide round-up of practices in this respect shows a convincing amount of use of facilities, much of which were originally devised for other construction industries. Proper modification as to weights, strengths, attachments and mobility have proven them to be feasible and productive of marked economies on utility systems. All this is testified by the case treatments assembled in the feature insert in this issue.

What, therefore, has not in general been a conscious and embracive plan has been a subconscious one executed step by step as results indicated the economic virtue. Truck and car fleets for routine functions have long been subjected to scrutiny and out of the studies has come a determination to set up a consciously planned collection of such mobile units. Now it appears there is equal justification for looking at other pieces of equipments in the same critical way.

Excavators of all types are being used, even in city work. Tractors, cranes, concrete mixers, bulldozers are manifestly being operated with advantage in lowered cost and so are the many other forms of mechanical equipments. It is confidently believed that study of these candidly reported benefits can contribute to the much needed control of costs in construction and maintenance operations.

What Does Fluorescent Lighting Cost?

IN THIS ISSUE there is presented for the first time a cost analysis of incandescent, mercury and fluorescent lighting. This is especially valuable at this time because of the amount of misinformation that is in people's minds today regarding fluorescent. The authors have analyzed cases which may be said to represent extremes in the economics of lighting, on the one hand comparing an inexpensive efficient general system of incandescent lighting with a much larger number of small fluorescent lamps providing the same level of illumination, on the other hand relatively expensive and inefficient filament lamp systems, against fluorescent lamps, used either to obtain color effects or to provide supplementary lighting close to a work surface.

In the first instance, fluorescent lighting is shown to be substantially more expensive than incandescent lighting and in the other cases to cost considerably less. Between these two extremes there appears to be an extensive middle ground where the cost of fluorescent lighting will probably not vary widely above or below that of filament-lamp lighting.

The general trend of the various curves included in the article will not seem strange to those who have kept in mind both the relatively high efficiency and the relatively high renewal cost of fluorescent lighting. They suggest, too, that since renewal expense is likely to be the largest single item of operating cost, special thought should be given to minimizing that item. As a case in point, one's examination of manufacturers' listings will indicate that 3- and 4-ft. lamps cost only 30 to 40 per cent more than 1½- and 2-ft. tubes, consume twice the watts and give more than twice as much light. In fact, it is stated that the total cost of lighting with the 4-ft. tubes recently announced is 25 per cent less than for the older, shorter lamps. This fact might have worked quite a change in the locus of the authors' Curve D, for example, had the new tubes been available at the date the article was submitted.

In the earlier part of their article it is shown very graphically that the high-intensity mercury lamp is robbed of much of its efficiency and economy when combined inside the same diffusing globe with incandescent lamps. It is evident from these studies that where circumstances allow, a more efficient way of obtaining color modification is by alternating mercury vapor and comparable incandescent units on adjacent outlets throughout the installation.

The analytical approach such as this article presents has been needed for some time to help clarify the thinking of the industry. It is obvious that incandescent, mercury and fluorescent lighting each has a place and that something other than efficiency of luminant must be taken into consideration before making any decision. With growing public acceptance of mercury and fluorescent lighting, additional data should be forthcoming to supplement the valuable contribution of the authors.

Floodlight the Crossings

AN EFFECTIVE WAY to minimize accidents at railroad crossings by use of floodlighting was suggested at the recent meeting of the American Railway Engineering Association meeting. It is apparent that the use of distinctive color floodlighting would indicate caution to the high-speed motorist who now relies upon bells, signs or red signal lights that do not always give effective or sufficient warning of crossings.

It would not be difficult to have the lights actuated by an approaching train. Moreover, the cost of continuous floodlighting would be much less than the cost of grade crossings. Many accidents occur because motorists drive into the side of a train on a crossing, and it is quite evident that the present cautionary signals and devices are not adequate for the present high-speed trains and automobiles. An industry movement to use floodlighting at crossings would be of public benefit and also bring good business to utilities and manufacturers.

REA Co-operatives Need Help

REA's chickens are coming home to roost and they don't all look so good. When the government, in search of rural favor, criticised the utility industry for keeping service from the farmer and offered to rectify that situation by financing line construction, the farmer was pictured as hungry for electricity and willing to pay within reason for service. And so some hundreds of millions of dollars were spent, and are still being spent, to provide farmers with electricity on the basis of loans repayable at interest in 20 years or more.

In order to make it just as easy as possible for the farmer, wholesale rates from power companies were hammered down through threat of Diesel competition. That these rates may not be profitable to the power companies is immaterial to the government.

Line construction costs have been reduced through simplification, lower construction standards, competition between contractors and suppliers and more lately through syndicate buying. That some of these practices have disrupted the market is again immaterial.

Finally, when it was found that the farmer wasn't using enough electricity, a raid has been made on the appliance market. That this may hurt dealers, wholesalers and manufacturers is also immaterial.

The sad truth, which sooner or later must be faced, is that rural electrification is not yet on a paying basis. The utilities found that out long ago, and that is why more lines were not built. The farmer is no more entitled to something for nothing than is the city dweller—even if he does have a vote.

And we haven't begun to see the real grief in the REA lines. After getting all investment costs down, as well as appliance costs, they still can't pay out and serve the farmer properly. These lines are, in fact, small utilities and need competent people to run them. The idea that being co-operatives they could be run co-operatively by members is all wrong. And this is being found out.

There is no question but what REA has made some worth-while contributions to the rural electric market, but it is not going to help matters by extending this market into areas that are still more unproductive. The problems are those of operation, maintenance and load building. While REA has in its personnel some excellent men, men who got their training in the utility industry, it has not man-power to undertake the local work.

Instead of constantly battling the utilities, it would seem that more could be gained by seeking their co-operation in improving the situation. It's nobody's fault so far that the rural lines are not doing better. It will be somebody's fault if all of the available help is not utilized to improve matters. It will be somebody's fault if, knowing that these lines cannot pay out, the REA continues to loan taxpayers' money for constructing lines in still poorer territory and much less likely to pay their way.

Knuckle Cracking

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

REMEMBER that neighborhood bully, when you were a little fellow, who, after taking your apple, would pretend that he was going to return it? How he would laugh when you snatched in vain! Especially if he cracked your knuckles in the process with a stick you had not noticed!

Now it comes under the head of "appeasement." Only it's a three-cornered operation now. Roosevelt takes your apple. Morgenthau, Hopkins, Hanes and Congress offer it back. But when you reach for it Roosevelt cracks your knuckles!

The drama is still unfolding. It is a bit early to be sure that those hinted tax revisions with a view to encouraging business are out the window. Just maybe, Harry Hopkins will persuade Roosevelt to give business back the core of its tax apple. But it doesn't look like it from where we are sitting. In fact, it begins to look as though Roosevelt never intended to build Hopkins up as his successor at all, or at least that idea of making Hopkins acceptable to business was a figment of certain fertile imaginations. It looks a good deal more as if the very appointment of Hopkins, with attendant appeasement rumors, was merely the gesture of holding out the apple, with the ruler carefully poised for knuckle cracking all the time.

Never Hid Ruler

But it is only fair to the President to say that he never hid the ruler in this case when he was talking for publication. Never did the President conceal his own opinion that the total of *estimated* tax receipts from corporations must not be lowered. That, in this unfortunate situation, is the ruler.

The whole picture has been so misrepresented, and so little understood, coming out, as it did, in piecemeal fashion, that a brief history is in order.

About the time that Morgenthau, Hanes and Hopkins began to talk their idea of encouraging business the Treasury experts began working on various schemes. The whole idea was to encourage business, to induce investors to put money in new enterprises or the expansion of old ones.

No. 1 on the list of industries to be encouraged was the electric business. It was No. 1 because William O. Douglas, newly appointed justice of the Supreme Court, had been harping for several years, while he was head of the SEC, on the idea that if fear could just be removed and hope of profitable investment substituted in this one industry, there was a spending power of one billion dollars a year there.

This idea was sold to Roosevelt by Douglas after more than a year's arguments. It was sold to Hopkins. Morgenthau and Hanes did not need to be sold on it. And so TVA bought Chattanooga and Memphis privately owned electric properties at prices—if not high—at least well above the concept entertained by Senator Norris, John Rankin, leader of the House public ownership bloc, and David E. Lilienthal.

It is important to note here *why* this was done—*why* Roosevelt deliberately reversed his own attitude—*why* he outraged one of the most enthusiastic groups of his followers, those agreeing with Norris and Rankin. Roosevelt himself did little, if any, public explaining, but it so happened that at that very time—in the month preceding the TVA settlements—Hopkins was up for confirmation in the Senate. Plenty was said by Mr. Hopkins in private conversations with senators, and with certain gentlemen known to have influence with senators. The whole idea was to encourage business and investment, to produce good times if relaxation of government interference and softening of federal taxes would bring it about. And the necessity of having good times so that the 1940 election would not throw the New Deal out the window was not soft pedaled. It was stressed.

With these facts in mind, experts in the Treasury and key members of Congress worked out a taxation scheme. The idea was to repeal the last vestige of the tax on undistributed corporation earnings, modify the capital gains tax still further, repeal the tax on capital stock, etc.

During all this planning there was no thought that it would be vital to curb public spending to precisely the amount that *estimated* revenues were to be cut. There was public talk about it on Capitol Hill, but it did not enter into the tax revision scheme.

The idea was to gamble on the hope that, if taxes on business were reduced, business would boom, and, if the hope came true, federal revenues would increase sufficiently from the ordinary corporation income tax to make up for the losses involved in the repealed taxes.

Must Hold Revenues

This idea had made much progress. Congress was apparently perfectly willing to give it a chance. Then Roosevelt cracked his ruler. Never, he told the newspaper men, had there been any objection to reducing any particular tax on the corporations which, in the opinion of Congress, would have the effect of encouraging investment. But, of course, the revenues must be held at par. That is, if there were any reduction of any tax on business, some other tax on business, calculated to produce an equal amount of revenue, must be imposed!

To make this picture worse, various hundred per centers on Capitol Hill, notably Senator Schwartz of Wyoming, began to give their ideas as to what amount of boost the corporation income tax would require to make up for the loss on other business tax concessions. Schwartz mentioned 30 per cent. Various others mentioned figures ranging from 22 per cent up to 30 per cent.

[*Continued on page 134*]

Mechanized Construction Saves Utility Dollars

PRESSURE TO CUT COSTS never was greater on the electric power industry than now. Squeezed between ascending taxes and descending rates, the system construction and maintenance dollar must reach farther than ever. To this end many men have labored diligently to simplify designs, standardize equipments and methods and organize operations for most effective work. The results of their activity appear in a constantly growing mechanization of field operations. Slowly, steadily and irresistibly, the power business has taken to mechanized tools. In fact, the round-up here presented shows that this trend has actually amounted to a program without any conscious intention in that direction.

This mechanization has known no limits of size. It reaches from hand tools, such as jacks, splicers, pruners, hot-line tools and bolt-cutters, through power drills and pipe pushers and tampers and pumps and pavement cutters to such massive tools as excavators, concrete mixers, pole augers, bull-dozers, cranes, tractors and 30-ton trailers. Of course this has carried with it the whole range of available automotive equipment, adapted and tooled to do the unique tasks of the power industry.

Now what has the industry gained by applying these productive aids? For one thing, it has made the budgeted construction and maintenance dollars cover more jobs. It certainly has not displaced labor, because the industry has practically as many employees now as it ever had, although the distribution has changed. It has made every job less onerous, safer and more attractive. It has shortened delays and speeded up improvements in service. It has reduced interference with the traveling public. It has had a favorable effect on supervision, insurance, standardization, work progress and simplified design. In short, it has helped to meet the insistence upon lower unit costs.

MECHANIZED EQUIPMENT

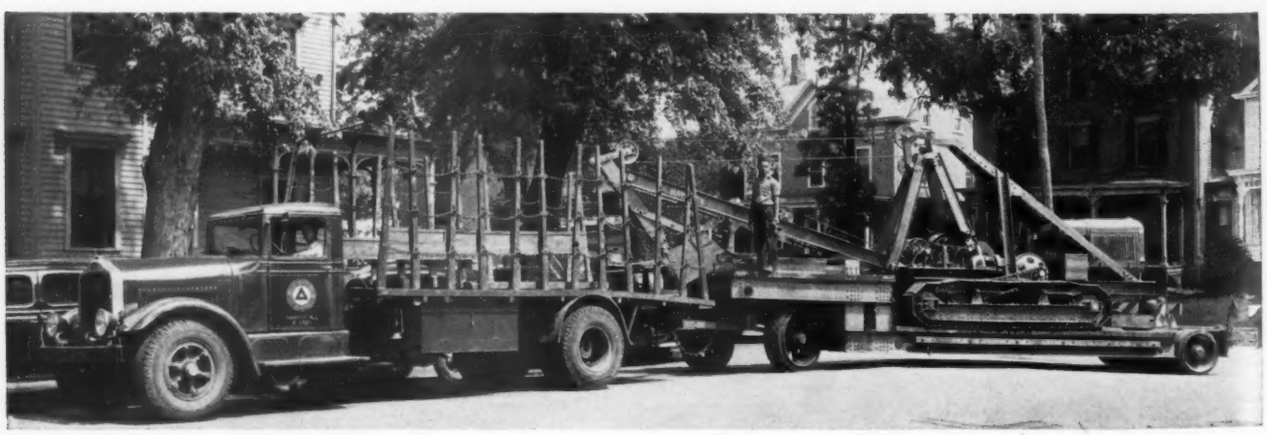
USE OF mechanical aids in construction and maintenance operations has been a matter of long standing and consistent evolution in the system of the Public Service Electric & Gas Company of New Jersey. In fact, this company has been a leader in applying excavating, erecting and accessory tools many of which were proving their worth in other fields of construction. Some, on the other hand, are equipments which were originally adapted particularly to the needs of electric construction and maintenance by the company's own engineering and shop forces.

Over the last decade and a half this company has, therefore, evolved a program of mechanization which has tended continually toward the use of heavier and more versatile types of equipment. Many of these are in a class which utilities, in general, have lagged in applying, possibly because their territories afford a less compact and densely settled collection of communities than New Jersey. It should be evident, however, that the wide-scope and intensive commitment of this particular company has been based on constantly proven benefits from larger and more productive equipments. Quite naturally this program has been accelerated by the adaptation of automotive equipment into the fields of lifting, pulling, excavating and pile driving, as well as material moving.

In the expansion of this program it was early realized that the very mobility of most of the equipment which has the other desired characteristics is a factor in maintaining steady employment through the elimi-

5-ton tractor brush cutter removes five-year growths

Cutter attachment has two sets of blades. One set cuts 3 or 4 in. above surface. The blade is sharp enough to slice through previous stumps. Readily cuts down 3-in. trees. Another set of blades uproots the growth by partially cutting the roots and then tearing the growth out by traveling a few inches below the surface.



30-ton highway trailer transports excavators

Here shown carrying Bay City back-hoe ditcher. Used for all kinds of heavy equipment, including transformers. The light weight is 21,500 lbs. and 80 per cent of the carried load falls on the rear wheels. The wheels and tires are designed for a maximum of 800 lbs. per inch width of rubber in contact with the pavement in accordance with state regulations.

SERVES, SATISFIES, SAVES

Wide variety of large mobile equipments and evolved rigs show versatility in construction in both congested urban and sparser areas of diversified terrain

Trenching machine excavates for conduit lines

Adjustable teeth vary width of cut from 18 to 30 in., with a limiting depth of 5 ft. In ordinary soils digs about 500 ft. per day unless obstructions are encountered. Equipped with "Anticipator" to detect the presence of such obstacles and dig up to and over them. Gasoline-engine drive. Excavated material dumped to one side and removed by truck crane. One man required for operation. Used in suburban and rural areas as well as occasionally in favorable urban territory.

Michigan truck crane applied in many ways

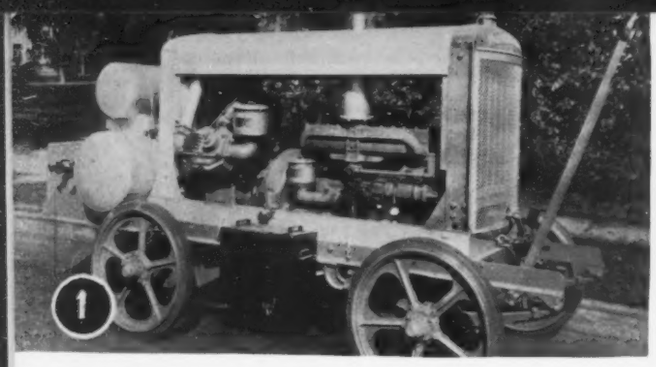
Used for digging manhole excavations and placing equipment, placing or pulling pile sheeting, storing materials or setting poles, especially ornamental street light standards. Also lifts manhole covers, handles transformers and other heavy yard equipment.

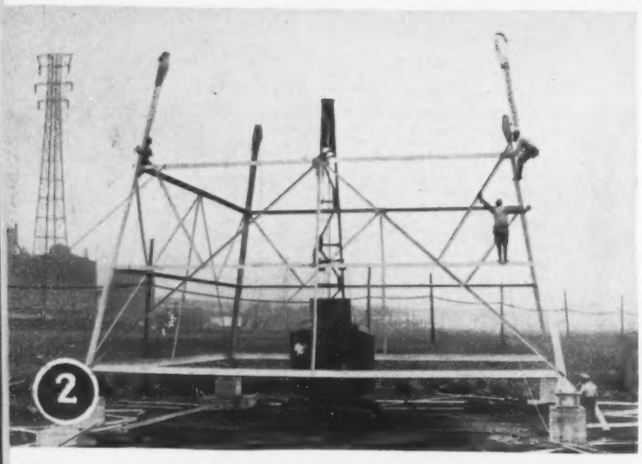
Pouring concrete for tower footings and manholes

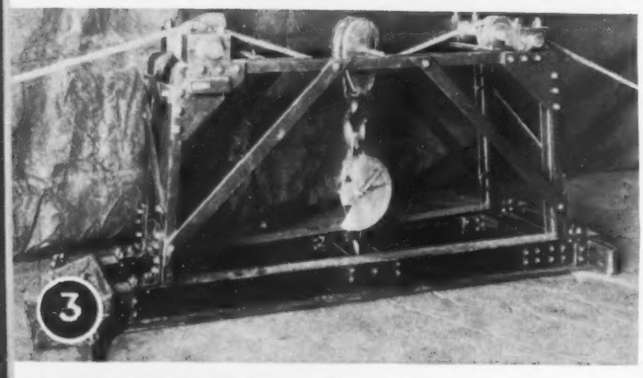
For large foundations the concrete mixer is run up onto a platform and pouring is done by gravity. For smaller footings and manhole shells a bucket elevator is used. For manholes the concrete is often distributed by means of a funnel equipped with chute that can be rotated and extended to reach the corners.

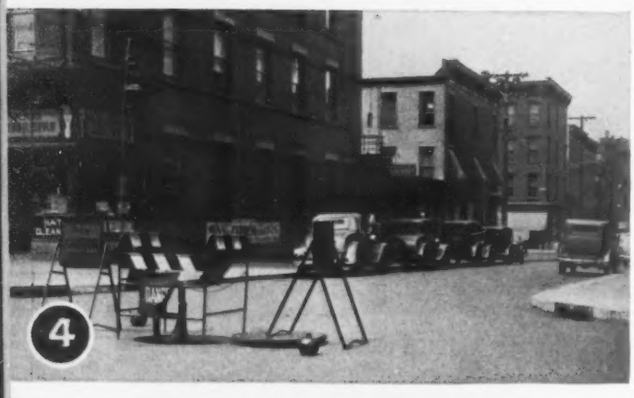
nation of the delays that marked the older and more cumbersome ways of doing the jobs. Construction and maintenance schedule boards show, under the influence of mechanized equipment, a continuity of operations. Also, the motoring public has grown to expect minimum interference with traffic. Mechanized facilities have proven a great help toward consuming minimum street space in construction operations, completing the job promptly and moving off to another one on the schedule.

The accompanying selection of typical equipments at work on this system is representative of the extent to which mechanization has penetrated all the outside plant activities of the company. In underground work, soil, pavement, traffic, subsoil obstacles are all variables which affect the costs and often to a controllable degree. Nevertheless, these variables have not been such as to prevent the effective use of a wide









1. COMPRESSOR FOR AIR-POWERED TOOLS—Compressor unit with rubber-wheeled chassis supplies air for pavement-breaking tools, for air tampers now used exclusively, for clay digging operations and for sheeting hammers. A battery of these compressors has a range of from 110 to 350 cu. ft. per minute at 80 lb. pressure.

2. TRACTOR CRANE IN TOWER ERECTION—Erects first section of tower. K-members then installed after tractor has been removed and erection is completed with gin-pole rig.

3. DYNAMOMETER ADAPTED TO CABLE PULLING—Tension in pulling operation obtained without breaking dynamometer into direct line of pull. Approximate value of pull and any obstacles to pulling operation show up on dynamometer.

4. WARNING SIGNS AND GUARDS

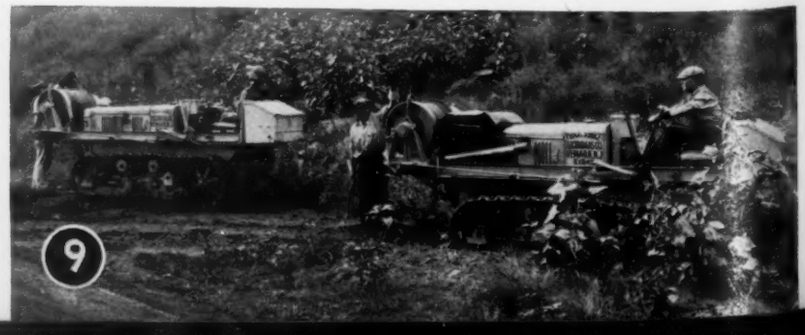
5. CABLE SPLICING—Furnace provided with windshield also acting as safety sign. Trunk houses cable splicing tools.

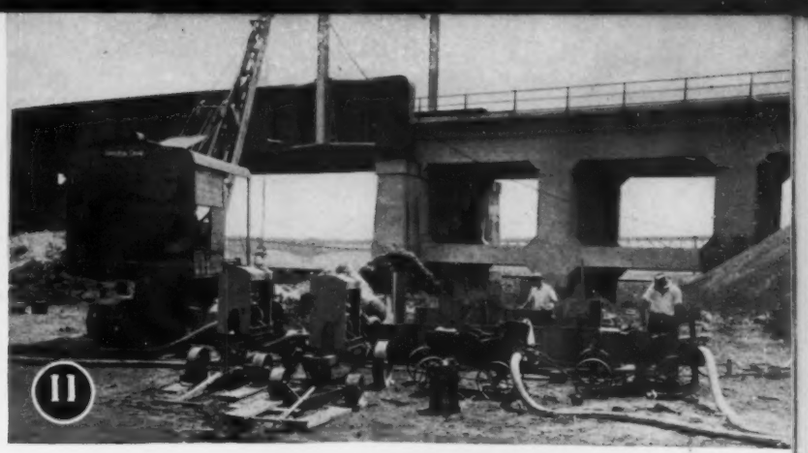
6. WIRE-STRINGING REEL JACKS—Three reel jacks set up to pull in conductors. Reel stand in rear with brake drum for maintaining conductor taut.

7. PILE DRIVER STEAM OPERATED—Has leads long enough to take a 75-ft. pile; however, in order to obtain striking distance for the hammer a hole is first made by driving a spud.

8. DYNAMOMETER TESTS TOWER FOUNDATIONS—In this way a dynamometer is used to test the lateral resistance to displacement of the friction piles supporting tower foundations. Two are pulled together and, as a typical criterion, a $\frac{3}{8}$-in. displacement is allowed of each foundation for a 17,000-lb. pull.

9. GANG OF TRACTORS PULLS THREE CONDUCTORS SIMULTANEOUSLY—Each is powered to 45 h.p. to apply to winch in pulling operation. Four have been used when also pulling an overhead ground wire at same time with conductors.



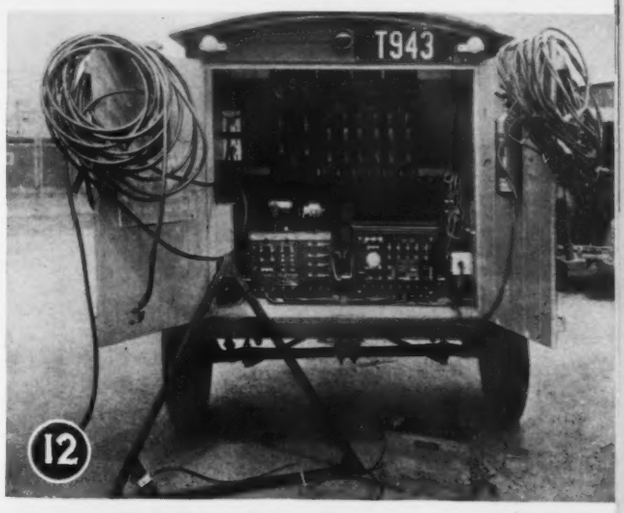


10. STANDARD TOOLING EQUIPMENT FOR TRUCKS — Equipment for tool box serving underground gang of 75 men.

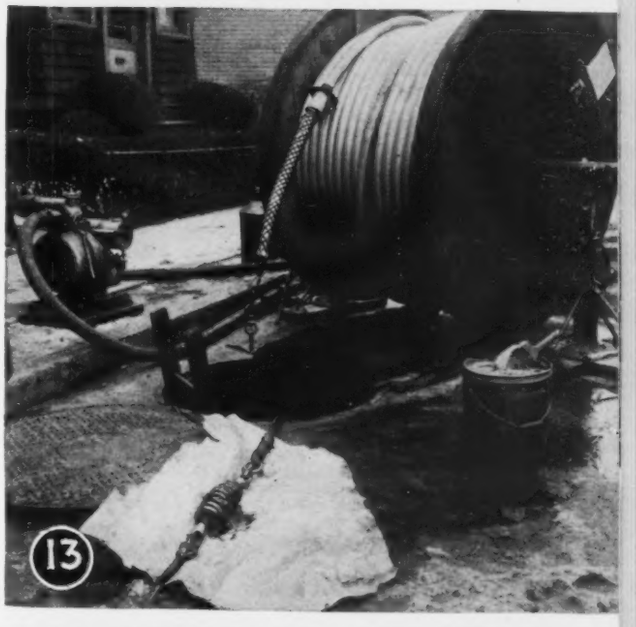
2 Axes. 6 Bars. 2 Bits, ¾-in.
12 Blades, hacksaw. 6 Boots, rubber.
2 Braces, carpenter. 1 Broom, house.
6 Brooms, push. 1 Roll burlap.
50 lb. cement, duct jt. comp.
3 Chains, locking ends. 4 Chains, 20 ft.
12 Chisels, bull pt., lg.
12 Chisels, hand. 6 Coats, rain.
2 Connection, ¾-in. male.
3 Connection, 3-way. 1 Cutter, bolt.
2 Cutter, pipe.
12 Drills, ¼-in., hand.
3 Drills, ⅜-in. star.
5 Edgers, sidewalk. 12 Flags, red.
1 File, 12-in. bastard fl.
1 File, 12-in. bastard rd.
12 Pr. goggles. 2 Gratings, manhole.
6 Guards, chisel, rubber.
6 Hammers, claw. 1 Hammer, paving.
6 Hammers, 4-lb. 6 Hammers, 14-lb.
3 Hatchets. 6 Hats, rain.
2 Handles, drill. 60 Handles, pick.
3 Hoes. 6 Hooks, manhole. 6 Pails.
1 set hooks, scaffold.
1 Hook, sheathing pulling.
100 ft. Hose, ¾-in. air (extra).
24 Jacks, trench. 1 Kit, first aid.
5 Jointers, sidewalk.
1 Knife, conduit. 4 Ladders—14 ft.
1 Level, mason. 3 Lines, mason.
2 Mauls, wood. 1 Oiler, machine.
2 Oilers, teapot. 100 Picks.
3 Pliers, cutting. 6 Pullers, nail.
1 Puller, sheathing. 2 Rakes.
2 Reducers, hydrant. 80 Rods, conduit.
6 Ropes—20 ft. 2 Saws, crosscut.
4 Saws, hack. 6 Saws, wood. 1 Screwdriver.
60 lb. Shovels, round. 12 Shovels, square
1 Snake, steel. 3 Spades.
1 Square, carpenter. 2 Wrench, Stillson.
6 Tampers, hand. 2 Tarpaulins.
1 roll Strapping, pipe.
1 roll Tape, friction. 5 Tongs, chain.
1 roll Tape, rubber. 4 Tongs, iron chisel.
6 Tongs, rubber chisel.
6 Trowels, brick. 6 Trowels, plaster.
1 roll Wire, galvanized.
1 roll Wire, soft tying. 1 Wrench, hose.
2 Wrench, hydrant. 1 Wrench, monkey.

Miscellaneous Supplies: 1 box stationery; brushes (3 paint, 6 whitewash); cone slump test; connection (2 hose-pipe, 2 ¾-in. fem.); 1 box yellow crayon; 2 drinking fountains; funnels (2 large, 1 small); 5 gal. gasoline; grease (1 lb. lubricating, 5 lb. rust-resistant); 5 gal. kerosene; 2 lb. lampblack; 1 lanternlighter; lanterns (60 red, 2 white); 12 lanternwicks; 3 locks; nails (15 lb.—6 dwt., 15 lb.—10 dwt., 15 lb.—20 dwt., 5 lb.—20 dwt. galvanized); 5 lb. oakum; oil (5 gal. form, 5 gal. machine); 1 gal. asphalt paint; 1 roll tar paper; plugs (12 2-in. bell, 12 4-in. bell, 6 5-in. bell, 36 2-in. wood, 36 4-in. wood); 2 lb. duct seal; 1 bar laundry soap; 2 spigots; 1 box salt tablets (summer); 1 ¾-in. valve; washers (12 ¾-in. air hose, 6 3-in. pump, 6 4-in. pump); 1 gal. waterproofing.

11. BATTERY OF PUMPS HANDLES TOUGH UNWATERING PROBLEM—A troublesome water condition was met by using two centrifugal and two diaphragm pumps to keep down water in excavation for a tower foundation on Kearney-Hudson North line.



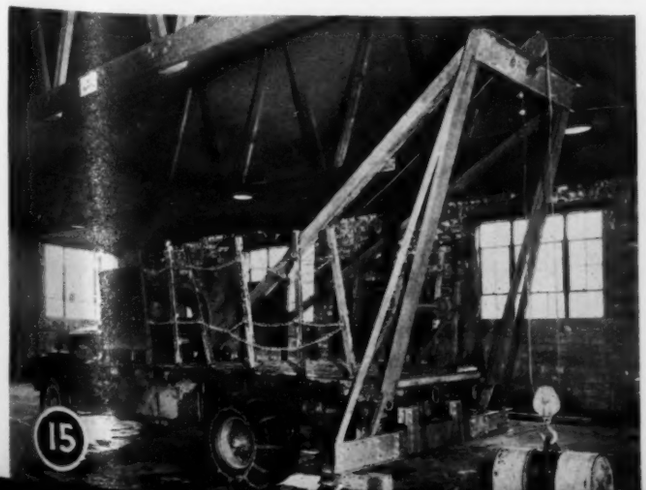
12. LUNDIN FAULT LOCATOR—Used for both underground and overhead lines. Apparatus imposes a 60 cycle wave with superimposed beat frequency on faulted circuit and then locates it with either the triangular exploring coil for overhead or a more compact pickup coil for cables. Here transported on a 2 wheeled trailer.



13. SET-UP READY FOR PULLING IN CABLE—Cable end prepared with pulling grip and bell-mouth for duct end. Cable pulling compound at hand. Duct cleaner precedes fed-in cable and pump keeps manhole unwatered. Mattress protects sheath against abrasion.

14. TRACK REINFORCEMENT FOR UNDER-TRACK EXCAVATION—Equipment acceptable to all railroads so far encountered in under-track excavation. Extra rails provide running rail support by means of 1 x 5-in. hand-forged hangers. Up to an excavation 30 in. wide one rail is provided each side of each running rail. Beyond that two rails are provided (*i.e.*, eight all told for both rails in a wide excavation).

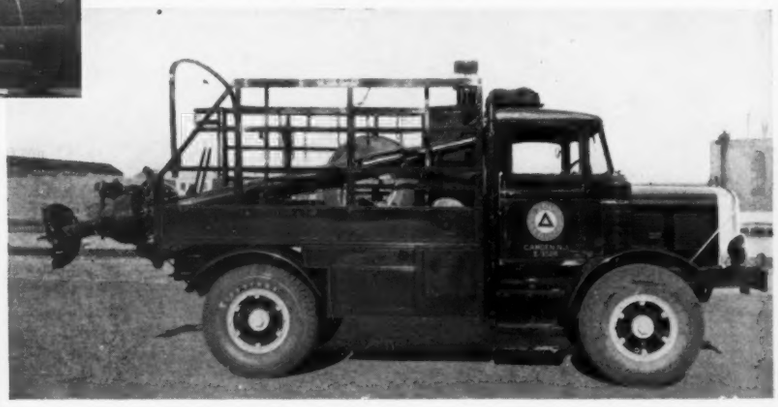
15. RIG HANDLES LARGE SUBWAY TYPE TRANSFORMERS — Detachably mounted on ordinary truck, this rig lifts and lowers subway transformers up to 5 tons.



Transformers maneuvered in and out of station entrances

Pump removes water from manholes

Novo 3-in. self-priming pump driven by gasoline engine is trailed behind truck and has capacity of 20,000 gal. per hour.



Earth borer used wherever possible

Degasifies cable reservoirs and oil

Air introduced by adding fresh oil removed by equipment on this truck. Gasoline engine drives 10-kva. alternator to supply vacuum and oil pump motors and about 6 kw. of heating for oil in cool weather operations. Warmed oil is forced under pressure into chamber which is maintained at vacuum of about 1 mm. The resulting oil mist is in prime condition to release air, which is then extracted by vacuum pump. Also used at any time when pressure in 132-kv. cable system develops an abnormal drop in reservoir pressure. Absolute pressure in the degasifier chamber is reduced to less than 0.1 in. of mercury before introducing the oil. Tank portion of the degasifier chamber has a capacity of 65 gal.

Ladder truck for street light maintenance

Shown in forward position. Can be swung 90 deg. either side to clear parked cars.

variety of mobile and portable tools. This has already been demonstrated in connection with the "Anticipator" described by C. I. Maust in the March 25, 1939, issue of ELECTRICAL WORLD. The "Anticipator" is used on all types of excavators applied in street and highway work by the electric department.

Some of the smoothness of execution of the job that spells this sense of satisfaction and achievement on the part of the working staff, along with a competency to do each job at an increasingly favorable unit cost of construction or maintenance, can be seen from the accompanying illustrations, judiciously selected from the company's photograph records by an ELECTRICAL WORLD editor.

Mechanization Widely Diversified

All areas show adoption of mechanized equipment to perform at lowered cost the tasks encountered in connection with overhead and underground construction and upkeep of distribution and transmission facilities

Tractor Crane Handles Poles

Kansas City Power & Light Company has recently purchased a tractorized crane that is especially designed to handle poles. It has a 21-ft. boom and

is mounted on a tractor. The crane is on a ball bearing turntable that can be turned through 360 deg. With its 2,000-lb. counterbalance it can lift a ton load with the boom in a horizontal position. Even the largest poles can be picked up and put anywhere with the greatest of ease. The crane operator has a full view of his operations at all times. It is used to unload poles from railroad cars and to move poles about the yard.

Sets Three H-Frames an Hour

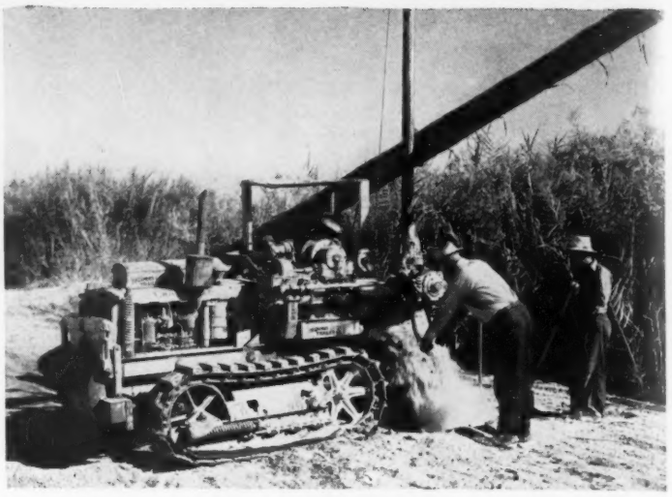
Working eight hours daily at 8,000 ft. elevation between Dillon and Kremmling, the Bureau of Reclamation, U. S. Department of Interior, Denver, Colo., was able to set three structures an hour with the equipment shown above. The bureau used a Caterpillar Diesel D-8 tractor, Le Tourneau power take-off and 40-ft. crane. Structures are 65 ft. H-frames.

Tractors Build Lines to Skagit Development

Tractor bulldozers for backfilling around tower foundations and winch-equipped tractors for stringing wire are being used by construction contractors on transmission lines for Seattle's (Washington) City Light Department from the Skagit hydro-electric development, 112 miles distant. About 120 cu.ft. of dirt has to be moved in filling in around concrete foundations on some 406 towers. Tractors are Allis-Chalmers units.

Cable-Splicing Truck Speeds Pumping

To pump out manholes in minimum time Lynn Gas & Electric Company lately substituted a specially equipped type of cable-splicing truck for a pumping outfit formerly hauled on a trailer to the scene of trouble, cutting down the time required by approximately two-thirds. A two-man crew (splicer and helper) operate the unit, which consists of a ½-ton Chevrolet truck equipped with a 2.5-in. Barton centrifugal ditch type pump driven by the car engine and having a capacity of 275 g.p.m. at 15 ft. head. The pump is self-priming from the engine. The truck carries an extensive line of underground supplies, such as torches, sleeves, connectors, solder and other material, as well as a ladder stowed on top for manhole service.



Tractor Digger on Rural Electrification

An average of 30 poles per eight hour day with a Caterpillar 22 tractor and Highway post-hole digger was realized on the Imperial Valley rural electrification program by the Imperial Valley Irrigation District, Imperial, Calif. Holes were from 5 to 9 ft. deep.

Safely Cuts Pole Bind Wires

For cutting binding wires on carloads of poles Buffalo, Niagara & Eastern Power Corp. has perfected a tool which does the job with safety. With the wire cutter shown, it is now possible for a man to stand on the ground and cut all wires. He stands at a safe distance to cut the last wires that hold the load on the car.

Dynamometer Sets Tensions on TVA Line

Field telephone used in conjunction with dynamometer hook-up to sag 636,000-circ.-mil ACSR on Wilson-Norris line; 1,840-lb. reading at 70 deg. F. on 800-ft. span with 30-lb. change for each 10 deg. change in temperature. Come-along equipment tailor-made for this special conductor, which has only a single steel strand for reinforcement. Pulling is done by light tractor.

Crane Truck Handles Poles En Masse

Two men and a heavy-duty truck equipped with a crane with an 18-ft. boom handle poles in the Melrose service station yard of Narragansett Electric Company in Providence, R. I., on virtually a "mass production" basis. The truck and attached trailer (shown) will easily carry 25 poles, but only fifteen are handled at a time because of state requirements. Poles are easily transferred from the yard storage over the rails shown to the point of lifting aboard the truck. Distance between truck and trailer wheels is adjustable by pin-hole locations to account for poles of various lengths. At left truck at work in the Melrose yard, and, right, compact arrangement of controls behind cab. These govern movement of the boom brake, boom lift, cable lift, clutch, gear-shift, etc., and speed up handling materially. This truck and two men have set a pole in a prepared hole on the highway in 2.5 minutes.

Aerial Ladder Truck

The Kansas City Power & Light Company has found many uses for an aerial ladder truck that was originally purchased to service highway type roadway lights. The lamps hang 22 ft. above the pavement. The ladder can be extended 25 ft. above the pavement.

This ladder truck is also used for the installation, maintenance and inspection of alley racks where climbing space is congested. It is used also to make aerial taps and to trim trees. Engineers find in it a way to inspect personally transformer, capacitor and other pole-mounted equipment.

The special truck body for this outfit was made in a local shop. A ¾-ton truck chassis was used. The ladder was purchased from a well-known manufacturer. It can be locked in almost any desired position.

Extra Reels for Trucks

Most all service trucks carry a payout reel, but this one has two, with a possible addition of another on the right side. Having the correct service cable ready to use is definitely a time saver and relieves congestion on the always-crowded small trucks. The Empire District Electric Company, Joplin, Mo.

Power Drill Speeds Manhole Work

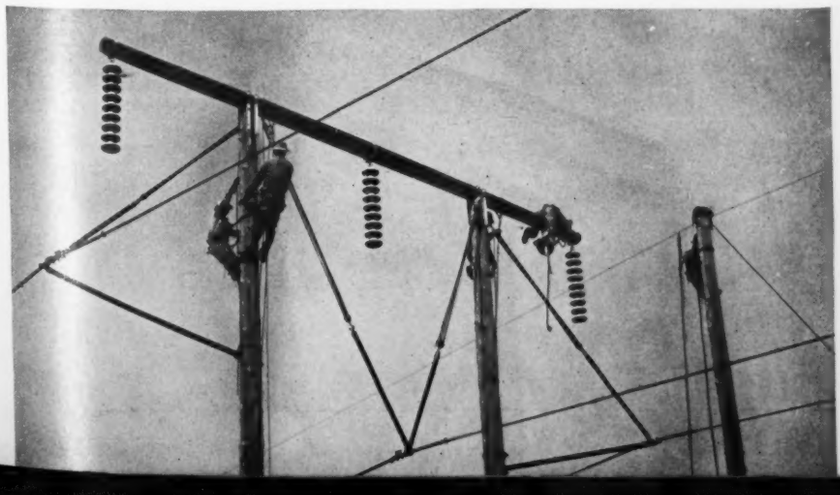
For miscellaneous drilling in concrete, brick or stone, Boston Edison Company uses a power-driven outfit which is conservatively at least four times as fast as hand work, greatly expediting placing of cable hangers in manholes. Power is supplied by a portable generator set weighing but 93 lb. over hard service cable to a combination motor-pneumatic drill designed to minimize vibration at the motor. The generator is rated at 1,250 watts, 115 volts, direct current, and is driven by a gasoline engine. A universal motor runs the drill. At times the set is used in temporary lighting. The outfit will drive a ⅝-in. hole in brick at the rate of 2 in. per minute. →

Boston Line Truck Built for Heavy Service

Diversified service is obtained from this 5-ton truck used in overhead line maintenance by the Boston Edison Company, the truck being equipped with a winch operated by the truck engine and an idler shaft and pulley to facilitate pulling cable and pole butts. Jacks are employed for heavy work at the rear end. Pole setting is also handled conveniently, storage space being provided at left above tool boxes for carrying a sectional crane and ladders above. Pikes are carried on right side, extending downward diagonally from front to rear.

Insulator Changed With Live-line Tools

Illustrated are (left) conductors lowered or displaced laterally on the Wheeler-Guntersville 154-kv. line by means of live-line equipment. Hot-line work required because line was sole supply for Guntersville Dam construction power, including cofferdam pumps; (right) operation of replacing spar arm on Wheeler-Norris 154-kv. line near Wheeler Dam. This was done as a practice job for the TVA hot-line crew.



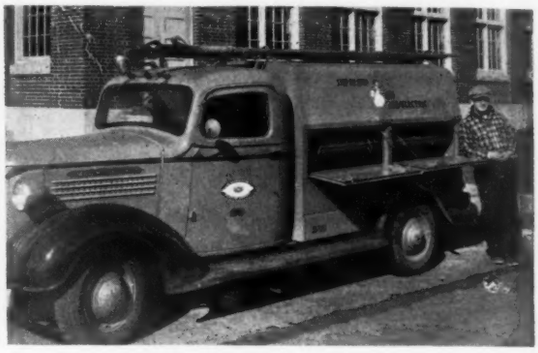
General-Purpose Truck Used at Lynn

Lynn Gas & Electric Company's distribution system maintenance is facilitated by the truck illustrated in the accompanying view of a unit designed for heavy work on both overhead and underground lines. Along with the equipment, the arrangement of storage compartments is the result of long experience, combining compact supply facilities with maximum accessibility. The truck is equipped with a 15,000-lb. main winch and a 5,000-lb. auxiliary winch for the mast derrick carried at the rear. The cable on the main drum is of $\frac{7}{16}$-in. preformed plow steel, which enables linemen to work without hazard to gloves in the event of strand failure. Length of boom on the rear hoist is 4 ft., giving an excellent clearance in lowering and raising transformers at manholes with the power of the truck engine.

Compartment layouts are extremely flexible, certain compartments being carried through the body from side to side and others part way. The two sides are different and the set-up provides for storage of maximum quantities in minimum space. The design provides adequate space for diversified tools and material.

Arc Lamp Maintenance Truck of Compact Design

Normally carrying a 28-ft. extension ladder on a frame and pedestal support, this truck, used by Narragansett Electric Company in Providence, R. I., permits high-speed coverage of territory, easy handling in traffic and quick access to arc lamps, whether mounted high above the street or at lower levels. The ladder is about 24 ft. long when fully extended, and truss bracing at the top cares for the loading under various angles of use without undue strain upon the material. Fine adjustment is available on turning at all points within full circle. About a dozen different angular positions of the ladder are available in relation to the horizontal.



Trouble Wagon Uses Streamlined Layout

To clear all parts of the vehicle possible from loose or overhanging equipment was a major point in selection of a trouble wagon by Narragansett Electric Company, Providence, R. I. The unit shown is arranged so that the doors on both sides are clear at all times; the ladder is carried on an electrically welded frame at the top, and tree trimmer and lamp-changing equipment are also stowed safely away in this position. It is general company practice to keep cab windows clear of ladders or other obstructions. This unit, employed in general service restoration work, carries an extended stock of switches, wire, insulators, tape, connectors and other supplies. It is highly mobile in traffic and when closed for road trips amounts to a metal-clad traveling storeroom.

Bulldozers and Pull Shovels Used

Erection of four transmission towers every five days was the over-all average of A. S. Schulman Electric Company of Chicago in erecting 560 towers on the city of Seattle's transmission line No. 2, a 121.8-mile, 240-kv., double-circuit line from Skagit River, Wash. A 70-ft. light-tangent tower, weighing 14,900 lb., could be erected in 5½ hours, after a two-man crew had laid out and partially assembled the sections.

An erection crew consisted of four top men, four groundmen, a truck driver and foreman. Partially assembled sections were raised by means of a gin pole supported in the crotch between the bracing and the tower legs and swung from corner to corner as required.

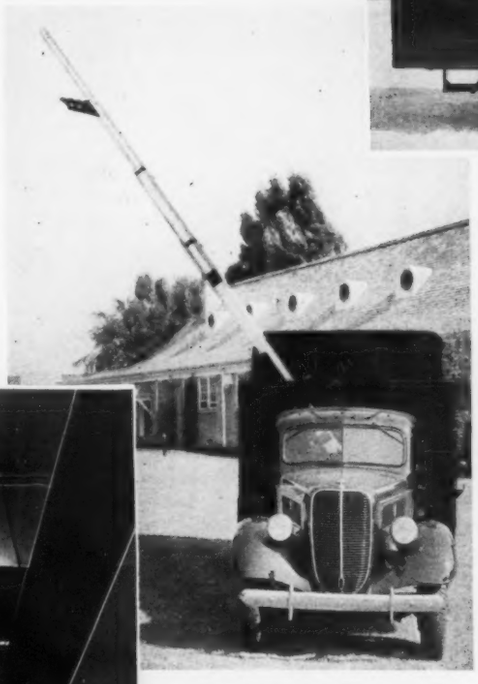
Use of machines to prepare ground for footing construction proved a time-saver. Bulldozers were used to remove stumps and debris from 100-ft.sq. areas. Such a clearing created an area in which mechanical excavators could operate so as to deposit excavated material at a point convenient for backfilling. Pull shovels were used to excavate earth foundations. A ¾-yd. machine proved effective where hardpan was encountered and a ⅝-yd. machine in soft ground. The two excavators averaged 2.5 tower foundations per day.

Pull shovel operating at tower foundation

Bulldozer clears the way for excavating machine

"Traveling Laundry" for Globes

Sometimes called by this colloquial name, this globe-washing and lamp replacement truck of the Boston Edison Company (one of two units operated by two men each) has a capacity, including lamp changes, of 80 per eight-hour day, which is nearly double the production formerly obtained by removing globes, transporting them to a central point, washing and drying out before returning to field use. With the present units, globes are removed and a substitute replaced at the pole; those taken down are washed and hot dried aboard the truck, and after about six pole stops are ready for remounting.



Globe washing truck with ladder extended and platform in place

View of truck pit showing ladder raised for pole service. Storage compartments shown

Hot water is supplied from a 54-gal. pressure tank which is filled with boiling water on leaving the service station in the morning. A 27-gal. washing tank and a 27-gal. rinsing tank are included in the truck's equipment, with built-in tubs of stainless steel having non-splash covers, drying racks, a ladder pit behind the cab and an extension ladder. The ladder is carried horizontally during road travel and is raised and lowered by crank. It is unnecessary for either man on the truck to step upon the ground in carrying on his work. Lineman's gloves are used for hand protection. The truck carries twelve globes, about 24 sockets, washing powder, 80 lamps, and has a special compartment for broken glass. It will easily serve a street lamp mounted 20 to 25 ft. above ground, allowing ample space for movement of traffic under the ladder or at the side.

Pole Gin for Light Truck Equipment

By E. D. FREEMAN
Supt., Transmission-Distribution Dept.
Oklahoma Gas & Electric Company

A light gin has been developed for use with slip-on body transportation equipment. Its use is confined principally to outlying districts where one- and two-pole extensions are encountered frequently and transformer change-outs are necessarily handled by a small crew. It consists of a 1-ton truck with regular frame for carrying ladders. The gin is attached to the carrying rack through a swivel slip-sleeve connection on the member at rear end of truck. In raising the gin, an opening is provided through bottom of the truck bed, which makes it self-supporting and eliminates the necessity of guys for light work. A plate at the bottom of the gin supports the weight on the ground. Truck is equipped with a power-driven capstan.

Transformer Loading Platform

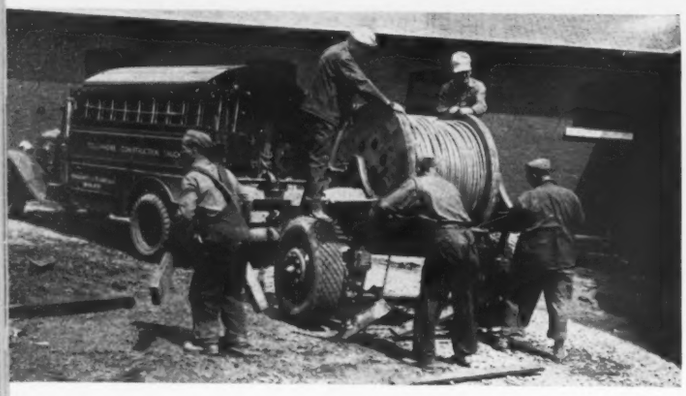
So that one or two men could pick up a transformer and load it, making it unnecessary for the line truck and crew to do the job, the Norfolk division of the Virginia Electric & Power Company conceived the idea of building an overhead swinging boom equipped with a chain hoist which could be easily maneuvered immediately above the desired transformer, which is then raised up on the chain hoist and the boom pushed or pulled in place over the truck. The hoist is then pulled out to the end of the boom or in the required position to place the transformer on the truck.

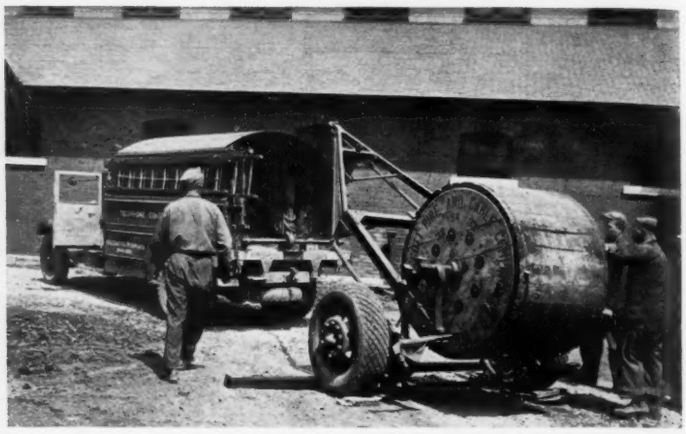
Details of materials for one such platform follow:

One 20 ft. long 10-in. iron pipe mast welded ¾-in. footings on top and bottom; four ¾-in. anchor bolts. Top held by six ¾-in. shackles and turnbuckles, with $\frac{7}{8}$-in. H.S. galv. guy wires with thimbles, fastened to 1-in. eyebolts in nearby brick buildings. Boom 19-ft. 2-in. long, 10-in., 25.4-lb. I-beam, 14-ft. clear of ground. Two 1¼-in. truss rods. Roller-bearing steel swivels for boom and truss. Entire structure will support 6,000 lb. Hoist is Ford clevis-connected "Tribloe" with plain Hyatt roller-bearing trolley. Capacity 2-ton, supplied with extra 10 ft. of operating chain.

Trailer Handles Reels Easily

By RAY BLAIN
Washington, D. C.





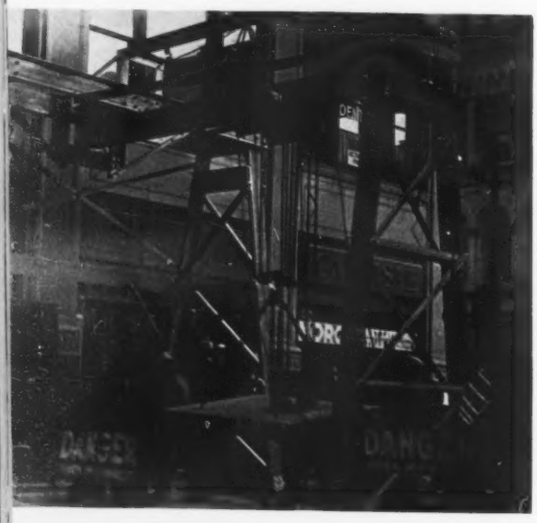
Cable reels are steadily becoming larger and heavier. Handling of these reels, which often weigh several thousand pounds, by the cable jack method always presents a difficult problem; it requires considerable time and effort and contains a certain element of danger. Use of a modern cable reel trailer makes this difficult task both safe and convenient.

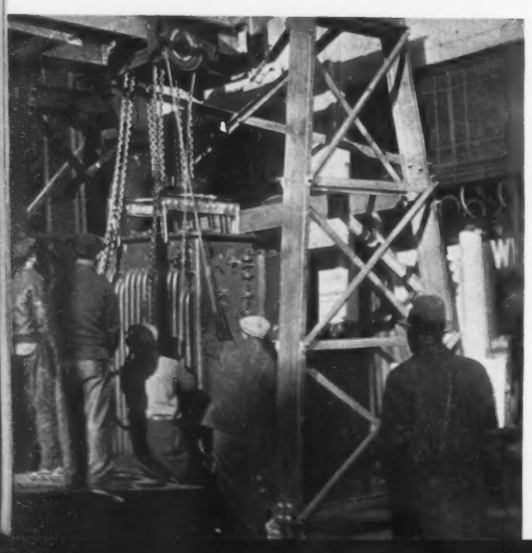
The trailer is moved to the reel storage, the winch line placed under a roller at the rear of the truck and attached to a ring in the end of the trailer tongue and the tongue is then elevated until the rear frame rests on the ground. A bar is placed through the reel, which is next rolled between the sides of the trailer. Wheels should be blocked and the winch line used to pull the trailer tongue down, elevating the reel and causing it to roll forward, where it is made permanent by two pins dropped in suitable holes. This places the reel in a convenient position for removing the lagging. The trailer tongue is attached to the pintle of the truck. It is transported to the job and easily spotted at manholes.

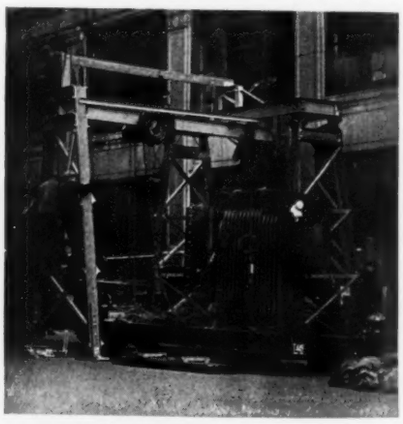
Pneumatic tires are generally used since they are much easier on curbs and sidewalks.

Aluminum Alloy Frame Handles Transformers

By R. R. HABBERLEY
Supt. Distribution
United Electric Light Company
Springfield, Mass.





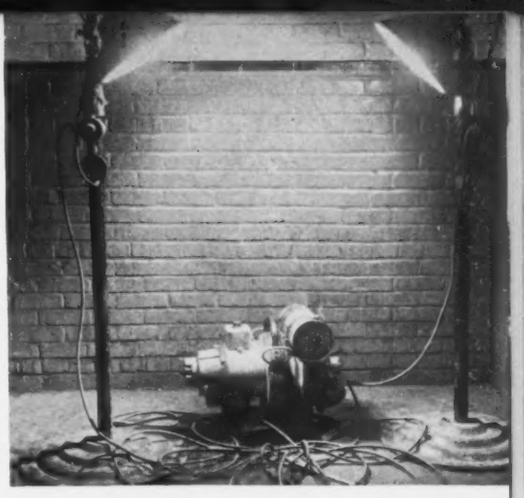


Handling network transformers has been greatly facilitated at Springfield by a special hoisting frame of aluminum alloy so designed that despite its apparent bulk there is room enough for a trailer carrying the apparatus to be drawn under the extension, and only the space taken by a truck on the road is occupied. The average time for installing a transformer, including erecting and dismantling the frame, is three hours. In transporting from one location to another we remove the horizontal members and tripod leg and move the H-frame on "dollies" from point to point as shown.

Pictured are—(top left) sidewalk slab lifted and ready to go on truck body; (top right) trailer in position under frame; (bottom left) transformer partially lowered; (bottom right) frame partially disassembled for moving to new location.

Reel Stacker Speeds Work in Stock Room

Portability in lifting machinery greatly increases its service flexibility, and the 750-lb. motor-driven lifter shown herewith at the Melrose service station of the Narragansett Electric Company in Providence, R. I., affords a good example of this. The machine is stacking reels of No. 6 solid, medium hard-drawn weatherproof cable in the distribution department and has a maximum lift of about 12 ft. Each reel weighs about 175 lb., full, and the lift can be operated as readily from the platform as from the floor level. The casters are equipped with automatic locks, and automatic stops are provided to shut down the motor at the maximum travel point. The machine can easily be rolled by one man upon an adjacent elevator and is used in merchandise storeroom activities on an upper floor part of the time, handling electric refrigerators and other equipment. In the case shown the lifter enables the company to release a 1-ton crane for other service and will handle work about three times as fast as the crane within its sphere of usefulness.



Portable Gasoline Engine-Driven Generator

After going through two very violent tropical hurricanes which flooded portions of Norfolk by as much as 3 to 6 ft., including transformer vaults, oil switches and other operating equipment, the need for emergency lighting equipment of small size and easily carried was quite evident to the Virginia Electric & Power Company. The generator was purchased from C. K. Koontz Equipment Company, Pittsburgh. The order read:

"Homelite" Model C, alternating-current, portable gasoline-driven electric generator, 1,000 watts, 110 volts. Cost, $286.50. Freight allowed to Norfolk.

The floodlights are described as follows:

Benjamin utility portable floodlights No. 5905 for 300- or 500-watt lights, mounted on Emerson adjustable floor column mounting. Equipped with heavy-duty cord and waterproof switch (Russell and Stoll).

The generator is used as a source of power for such tools as pumps to pump out flooded manholes or other accumulations of water, also centrifugal blowers for providing means of expelling illuminating or sewer gas from confined or obstructed places such as manholes or flooded basements. Electric hand drills, grinders, chippers, screwdrivers and other hand tools can be used readily as long as the required energy does not exceed the capacity of unit.

Erects Derrick Speedily

Reading, Mass., municipal light department's 1.5-ton line truck stows away a steel derrick which can be assembled on the street in three minutes and used to erect poles up to and including 40-ft. lengths, only two men being required in this rapid set-up. The truck, used for general line maintenance and construction, recently erected 27 poles in a ten-hour day, using but four men all told and covering 120 miles of street. The derrick boom is 20 ft. long and up to 1,800-lb. work is handled without the use of jacks under the rear frame of the truck.

Transformer Bolt Wrench

Driven by a universal motor, this wrench speeds up the setting and removal of bolts on transformers about fivefold compared with hand work. Photo from Boston Edison Company.

Lamp Maintenance and Night Patrol

Lynn Gas & Electric Company uses this 1.5-ton truck with Seagrave ladder for street lighting unit maintenance by day and supplementary patrol work by night, using two men on arc lamp maintenance service and one for night duty.

Both series and multiple lamps, incandescent and arc, are maintained by units of this type. The ladder swings upward to a platform height of 20 ft. above the roadway, with one-man operation at any angle up to full circle around a vertical axis and about 50 deg. maximum from the horizontal. A stock of repair parts is carried in the cabinets mounted on the body.

Overhead Construction and Maintenance Mechanization

Mechanization offers the greatest promise of quick and profitable returns in the relentless search for lower construction, operation and maintenance costs of distribution systems

P. R. KNAPP, *Superintendent Electric Distribution and Transmission, Toledo Edison Company*

WHENEVER work is repetitive mechanization possibilities exist. While much of the work on distribution systems is of this nature, distribution departments have been relatively slow in mechanizing in contrast with other industrial and construction activities. This situation carries with it the advantage, however, of being in a position to profit by the experience gained from more advanced mechanized development of other industries. The alert mind can discover many applications and adaptations from the construction field and from industries entirely unrelated to distribution activities.

Each system has its individual peculiarities. What may be suitable and beneficial on one system may be entirely undesirable on another. Nevertheless, all systems have much in common and each can profit by some of the experiences and developments on other systems.

Progress along these lines consists primarily of adding to our knowledge of methods, or "knowing how," and not only in the use of apparatus in the physical sense. While it is true that mechanization is the most prolific source of improved methods, the objective of minimizing costs may be realized by either increasing or reducing intermediate equipment, and not only by adding to or replacing equipment. It's the method that counts. A very small amount of "know how" at the right place in a productive process may eliminate a lot of cumbersome equipment and unnecessary steps.

One very important point that may not be fully realized is that whenever a correct solution to a problem in methods is adopted it is nearly always followed by beneficial "by-products" or extension in applications that were not originally anticipated.

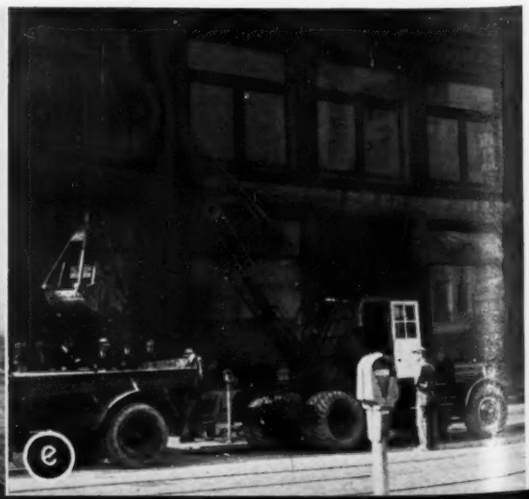
Versatile truck crane

Measuring line clearances (a), installing insulators (b), removing large trees (c), installing street lighting standards (d) and excavating for network vaults (e) are a few of the chores performed by this handy tool.

Mechanized Digging

Digging of pole holes is one of the obvious applications of mechanization unless the territory involved is mostly rock. A "digger" will pay large dividends not only in reducing unit costs per hole by more than 50 per cent but also by speeding up construction time and eliminating clerical and overhead expense that would be involved in employing casual laborers.

We have dug the holes and set as high as 72 poles, with crossarms attached, in one eight-hour day with one digger and a crew of three men.



The digger and chassis combination should be chosen for the type of work it is to be used on mostly. The accompanying illustrations show two different assemblies that have been satisfactory. To illustrate the possibilities of "by-products" we have found that we can dig and set poles in "quicksand" and wet soft earth formerly requiring barrels. This is done by picking up the pole and carrying it suspended from the boom. The hole is dug rapidly and the rapid spinning of the sides of the auger compress the sides of the hole sufficiently to permit digging. A few extra spins of the auger up and down in the hole, after it is dug, holds the sides of the hole for the few seconds required to steer the butt, of the boom-suspended pole, over the hole, and to drop it in place before the hole collapses.

In nearly all cases of setting poles the pole is picked up from the location where it was left by the pole-distributing crew and suspended from the boom as the first operation in pole setting. By doing this the digger carries the pole to its proper location for setting, regardless of whether the pole is to be located on the highway or back of farm buildings, on rural lines, to dodge trees. One spotting of digger auger over location stake only is required, the hole is dug and pole is automatically located to be dropped home without additional "spotting" of digger to set pole.

Powered "Screwdriver"

To illustrate an extension in application of good tools, screw anchors formerly "walked down" by means of a bar and slow r.p.m. by two men are now set in a few seconds by means of a power-driven screwdriver. The procedure on a sizable line extension job is to set all poles with crossarms attached, remove the auger bit from the digger bar and replace it with a "mechanical hand." This is an adapter type of attachment which fits the digger bar on one end and the eye of the screw anchor on the other. The power-leveling device on the digger permits rapid orientation of the digger bar to the desired angle and the power drive rapidly sets the screw anchor. In brief, the digger sets the poles on its out trip and the anchors on its return trip. Our soil conditions are mostly blue and yellow clay, which is ideal for screw type anchors. The mechanical hand referred to is one of our own developments and is mentioned here to illustrate the possibilities of extending the usefulness of tools designed for specific purposes.

Very often it is found that some possibility of mechanization which may be doubtful at first thought becomes almost indispensable after it is carefully thought out, adopted and full use is made of all its possibilities, which may, and often does, consist of a great deal more than was apparent when first considering the tool for a specific application.

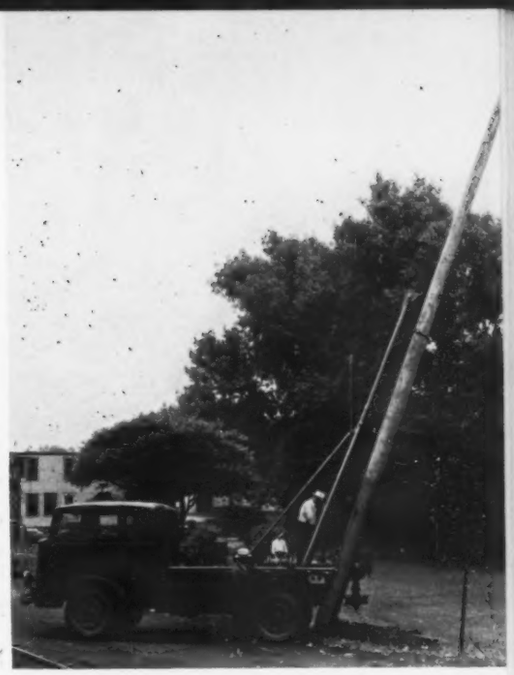
Versatile Truck Crane

Another important point well worth keeping in mind is that some striking possible savings through mechanization may be overlooked for no more reason than it involves using a modernized version of an old tool and its present-day possibilities are overlooked, or not investigated, simply because of experience with the old type of tool, whereas the modernized edition of the old tool may have startling possibilities merely masquerading under an old name.

Both of these points can be illustrated by the use we have made of a truck crane purchased in connection with the construction of a 132-kv. wood-pole "H"-frame type transmission line. Now truck cranes are not new; they have been in use for many years, but mention a truck crane to many construction men and they visualize a heavy, slow-moving, cumbersome, awkward to handle piece of equipment, useful chiefly to raise and lower heavy loads. The truck crane which we purchased is relatively inexpensive when contrasted with the cost of older types. It can wheel over the highways at 30 miles per hour or better, has compressed air fingertip controls for all of its functions and is very flexible to handle. It will travel over any ground that a truck will. In short, it bears only a distant resemblance to the truck crane of some years ago.

"Mechanized hand" puts down a screw anchor

Eye on end of anchor is connected to end of digger bar after auger is removed. Then the bar is tilted to proper angle to screw down the anchor.



Machine spotted once

Practice is first to pick up the pole and then to position the machine for the hole to be dug. Pole is dropped in right after the auger is lifted out. By spinning the auger up and down the hole a few times soft earth can be held long enough to get the pole to the bottom of the hole, thus obviating the need for barrels even in quicksand.

Sectionalized Boom

The boom is in sections, permitting various boom lengths from a minimum of 15 ft. to a maximum of 65 ft. While it was purchased primarily to use in connection with the construction of a specific transmission line, it has since the completion of that work been used for a wide variety of useful purposes. It is a splendid tool for excavating sidewalk network vaults with clamshell bucket. One handling of dirt from excavation to dump trucks greatly speeds up con-

Gasoline hammer, useful for breaking frozen ground ahead of the pole-hole digger

struction time and reduces costs, also helpful from a public relations viewpoint. It is used to install and remove 7-ton network transformers in and out of vaults rapidly, safely and inexpensively. Any one who has handled this sort of work without such equipment can well appreciate this advantage.

With the 65-ft. boom and a breeches-buoy type of bosun's chair, which we developed, it is used as a portable elevator to install or replace strings of insulators and measure clearances over highways and railroads on transmission lines. It is used to load and unload from car to truck, and *vice versa*, package and bulk goods, from cable reels to cinders, in the removal of large trees, and installing street light standards. Last year one of the neighboring properties had a stretch of 78 poles laid down on the ground by sleet and wind. This crane raised the poles with wires and all attachments back into place and, with temporary guying, service was restored in record time. The above is not a complete list of applications of this tool, but should serve to illustrate the thought.

Gasoline Hammer

There are many mechanization possibilities that can be solved readily by purchasing standard equipment off the shelf, so to speak, but which for some reason or other are not familiar to the utility field in general. Such a tool is a portable, self-contained gasolene hammer which we have among other things found useful in breaking through hard frost ahead of "digger." There are many such tools developed to meet a need in some other industry and are not well known in the utility world.

There are many steps in distribution work which in themselves are not important, but which in the aggregate are, because of the large multiplying factor involved, and these can often be mechanized to good advantage. Some examples of this are the use of a special stick, similar to a switch stick, to shove "come-alongs" out further on a conductor than a lineman can reach, thereby permitting pulling of conductor to desired position with one pull and eliminating snubbing off and repeated pulls, and the use of a special pick-up stick carried on all trouble rigs to permit safely picking up of live wires and, by means of a line attached, to hold live wire in the clear temporarily. These two examples were our own developments.

A vigilant mind and a flow of energy on some one's part is needed to see to it that worth-while possibilities in improved methods are adopted and extended after being conceived. There exists a certain amount of mental inertia in any organization that has to be overcome in order to secure the many advantages in improving methods through mechanization.

Special Carrier for Transformers and Poles

By E. D. FREEMAN
Supt., Transmission-Distribution Dept.
Oklahoma Gas & Electric Company

Frequently it is necessary to replace a transformer or a pole in an alley that has been closed, where because of fences or shrubbery our only access to the location is through an adjacent yard. A two-wheel carrier was designed for this purpose.

The carrier is so constructed that a transformer can be placed on the ground; the end of the tongue of the carrier can be raised, transformer fastened to carrier and, by lowering the tongue, transformer is raised from the ground, using the wheels of the carrier as a fulcrum. A pole can be hauled in the same manner, with the exception that the pole is balanced on the carrier and one end tied to the tongue. This carrier is capable of handling distribution transformers up to 50 kva., and poles of any size and class.

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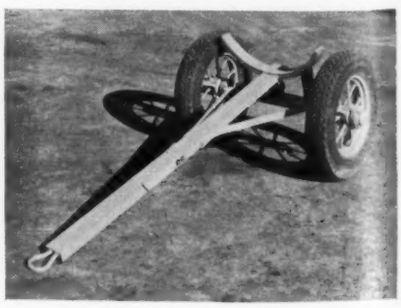
Special Dinkey Holds Two Poles

To secure symmetrical handling of two poles at a time on a dinkey the Narragansett Electric Company, Providence, developed the unit shown herewith, the feature of special interest being the curved saddle 42 in. long which holds the poles in proper alignment instead of permitting shifts in position, annoying to those transporting them in some other types of dinkey.

The frame is made up in general of 3-in. channels (the axle is a 4-in. channel), and the main drawbar is about 7 ft. long. Two poles can be handled without licensing the dinkey.



NEWS OF THE WEEK

Cheap Production Seen Key to Prosperity for Nation

Owen D. Young tells members of Southeastern Electric Exchange that government should take measures to aid business and restore confidence — Ide is new president

How long is it going to take America to learn that production—cheap production—is the key to that prosperity and to that economic strength which is the best guardian of democracy against attacks from within and threats without was the question posed by Owen D. Young, chairman of General Electric Co., before more than three hundred members of the Southeastern Electric Exchange, assembled at their sixth annual convention at the Ponce de Leon Hotel, St. Augustine, Fla., last week.

Drawing upon personal experiences, resulting from a sojourn in an old plantation cabin, Mr. Young presented dramatic parallels between form and substance, between the real and the false in the turbulent world of today.

Surveys National Scene

Surveying the current national scene in this light, Mr. Young readily conceded the wisdom of pump priming and other temporary expedients by government to distribute additional purchasing power and to incur deficits by borrowing to take the economy of the nation off dead center.

Difficulties which have subsequently developed have resulted, Mr. Young said, from the fact that while the deficit financing "medicine" was being administered as a stimulant, other conditions were being created which completely nullified the helpful effects of the medicine.

Pleasant remedies are not enough, the speaker declared, and a way must be found to make capital adventurous and men venturesome. In killing the mosquito of stock market speculation, we must not lay low the goose that will provide much needed funds for new capital, he said, capital for modernized plants, for improved processes and for better methods.

"In short," Mr. Young said, "let us stimulate purchasing power and coincidently let the government take decisive measures to help business and assure business confidence. Let us revise the capital gains tax, free capital for equity money in new ventures, restore railroad credit and remove apprehensions of utility investors. Insured loans were suggested so that private financial agencies can operate the machinery and take the government out of financing and out of the ultimate possibility of ownership and operation.

Appraises Situation

Harold F. Smiddy, Ebasco Services, presented an appraisal of the present situation of utilities from the standpoint of personnel, plant, product, price, performance and profits. From this realistic approach to the facts governing the utility business, Mr. Smiddy called upon the audience to break through yesterday's traditions, wake up to the new conditions which must be met and faced successfully

ADDRESSED MEETING—Owen D. Young, chairman of General Electric Co., told the members of the Southeastern Electric Exchange at their convention last week that cheap production is the key to prosperity and economic strength for the country. Walter B. Fraser, Mayor of St. Augustine, Fla., is at the right

BANQUET—General view of the head table at the banquet of the Southeastern Electric Exchange during its convention last week in St. Augustine, Fla.

so that utilities would escape the fate of the street railway business.

T. Justin Moore, vice-president and general counsel Virginia Electric & Power, and Jay Johns, chairman Virginia Public Service Co., also addressed the opening session. "We are in a day of synthetic socialism," Mr. Johns said, "and the utilities should depend more upon appeals to the public and upon its sense of fair play when fully informed, and less upon legal recourse.

Major Clark Howell, editor and publisher *Atlanta Constitution*, summarized the economic possibilities of the South and suggested renewed confidence in Southerners, constructive surveys of the South's resources, unity, an end to the demagogue through better education of Southern people, broadness of vision and an end to narrow sectionalism.

Rate cuts of $100,000 each in residential, commercial and industrial revenues of a company would require merchandise sales of $2,000,000 to restore residential revenues, and $1,600,000 of sales to restore the $200,000 cost in commercial and industrial revenue, H. S. Bennion, assistant managing director Edison Electric Institute, declared in speaking on the profitable system load building.

A. R. Wagner, Westinghouse Electric & Manufacturing Co., spoke on the power transmission situation which could be created by a national emergency and showed the new machine which demonstrates system surges in mechanical (Westinghouse) form.

Clayton Rand, editor and publisher of Gulfport, Miss., called for fire builders in the utility business who would fight aggressively for what they believe to be right. Truman C. Bigham, University of Florida, summed up the history and present status of utility regulation and public ownership trends. R. B. Roberts, Jr., closed the general sessions by a plea to sell electricity, to sell electric service, to sell the electric servant.

Committee chairmen reporting were W. A. Moore, vice-president Mississippi Power & Light; H. W. Booser, Georgia Power; R. I. Butterworth, East Tennessee Light & Power, and Paul Vecker, Carolina Power & Light.

New officers elected at the closing session were President Charles E. Ide, East Tennessee Light & Power Co., Bristol, Tenn.; vice-presidents, A. W. Higgins, Florida Power Corp.; L. P. Sweatt, Mississippi Power Co., and C. C. Curtis, Savannah Electric & Power Co. New directors are Bryan C. Hanks, member ex officio; M. J. O'Connell, Virginia Public Service Co., and Rex I. Brown, Mississippi Power.

Bryan C. Hanks, president of host company, Florida Power & Light, and president of the association, presided at all sessions.

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Air Conditioning Units

Ten central plant air conditioning installations of 96 hp. combined capacity were sold in Chicago in February, according to Commonwealth Edison Co. This compares with sixteen plants of 404 aggregate horsepower sold in February last year.

NEMA Told Utilities Factor in Recovery

Utility construction was put fifth by Assistant Secretary of Commerce R. C. Patterson, Jr., in a list of six factors pointing to an improved business outlook. Speaking before the NEMA members who were attending a meeting last week in Washington with Department of Commerce officials, Mr. Patterson said:

"The trend of power output, the recent improvement in railroad operating results and constructive clarification of the public utility problem should be considered as favorable influences in stimulating public utility construction and expansion."

NEMA was the first large trade group invited by the Department of Commerce to such meetings. In the two-day program there was presented a full review of the services of the department available for all electrical manufacturers. These included the services of the Bureau of Foreign and Domestic Commerce, Census Bureau, Patent Office and National Bureau of Standards.

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Approves Dam Bills to Aid Flood Control

The War Department has approved a measure which would grant the federal government exclusive jurisdiction over lands acquired for flood control dams and reservoirs, according to Senator Walsh, Democrat, of Massachusetts.

The department previously had given informal sanction to the legislation, which army engineers said would be passed by the Legislatures of Massachusetts and New Hampshire. This was said to be necessary before construction of dams and reservoirs in the Merrimack and Connecticut Valleys would be started.

As soon as the Legislature passes the desired measures the $11,000,000 allotted for New England flood control will be used.

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To Build Substation

Georgia Power Co. is constructing a new substation in Atlanta to handle power for the northeast section of the city. The station will be of the latest design, completely automatic, and will relieve the heavy load now being carried at other substations. The substation, to be completed by June 1, will step down voltage from 19,000 to 4,000 for distribution.

FPC Taxes, Rates Report Attacked as Most Unfair

Kellogg says comparison of publicly and privately owned electric utilities is "misleading"— Declares that commission made "most inexcusable error" regarding taxes

The recent report of the Federal Power Commission showing comparative rates, taxes and consumer savings of publicly and privately owned electric utilities and tax equivalent came under sharp attack by Charles W. Kellogg, president of the Edison Electric Institute. Mr. Kellogg stated that the report is "misleading and most unfair."

Rates of publicly owned electric utilities in the three main classifications of service were declared by the commission to be lower than those for the private utilities. The comparison of rates was made according to community size groups. The bills are average bills, weighted by the population in each community, and computed for each size group by multiplying the bill for each community by its population and dividing the sum by the sum of the populations of the communities included.

Shows Average Bill

The report of the commission shows that for communities of 2,500 population or more the average typical bills for privately owned utilities are higher than for the municipal plants.

In another section of the report it is stated that the aggregate of annual savings for all classes of electric consumers resulting from rate reductions during the 2½ years from July 1, 1935, to December 31, 1937, amounted to $115,300,872, or an average of $46,120,349 a year. For the 3½-year period ended December 31, 1937, the saving was $162,761,490. Of the $115,300,872 savings a total of $109,283,279 was attributable to rate changes made by privately owned utilities and $6,017,593 to municipal plants.

The report further states that on the basis of totals for the country publicly owned utilities paid 17.3 per cent and privately owned utilities paid 13.2 per cent of their gross revenues in the form of taxes and net cash contributions during 1936. Measured by "base revenues," which the commission said is a more accurate index, publicly owned utilities paid 18 per cent of their revenues in taxes and net cash contributions, as against 14.4 per cent for the private utilities.

Mr. Kellogg said that the commission, in making a comparison with the actual taxes paid by the private utilities, had erroneously lumped together a very small tax with "estimated" contributions by municipal plants for making a comparison with the actual taxes paid by the private companies.

"Buried in the commission's report is the fact that taxes paid by municipal plants in 1936 were only 1.2 per cent of revenues, that in fourteen states they did not pay a red cent, while the report shows the private companies paid 14.4 per cent of revenues," Mr. Kellogg said.

"The most inexcusable error of the commission is in confusing cash contributions with taxes. These contributions, made when, as and if funds are available, do not bear any resemblance to taxes paid regularly and under compulsion to a multitude of tax-gathering bodies."

Mr. Kellogg said that the report was misleading in that it failed to make a "fair" comparison.

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Vermont Considers "Little TVA" Bill

Proposals for the creation of a "little TVA" for Vermont are under consideration by the municipal corporations and franchises committee of the Vermont House of Representatives. Hearings have been held on the proposal, which would involve the creation of a Vermont state power authority as a corporation with power to acquire, in the name of the state, all private utility properties in Vermont.

The proposal provides that a study be made of all the state's natural water resources with a view to determining whether dams could be constructed for the combined purpose of flood control and electric power generation.

Opponents of the proposed measure argue that many employees of the private utilities would be thrown out of work and that municipalities would lose large tax revenues.

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Nebraska REA Project Reports Loss for Year

Public power districts in Nebraska are finding that running a utility is not all profit, as indicated by the report of the Norris Public Power District, named in honor of Senator George W. Norris, an outstanding advocate of public ownership.

The "yardstick" REA project has been unable to pay its way, according to the report to the State Department. The power district reported an "out-of-pocket" loss for the last year of $1,134. The project had borrowed $141,000 from the REA and was unable to pay interest or set up any fund for depreciation of facilities.

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Plans $25,000 Expenditure

Central States Electric Co. has started a project at Radcliffe, Iowa, consisting of transmission lines, substations, automatic switches and other equipment required to give the town a new 33,000-volt service line. The project is to cost $25,000.

LOAD BUILDING—More than 50 field engineers and home office department heads attended the discussions of various ways and means of using fluorescent lamps to build new lighting load for utility companies. The meeting was held last week by the G.E. incandescent lamp department at Nela Park

Congress Group Splits on TVA Investigation

Majority report gives government power agency clean bill of health, while minority is caustic in its finding — Finds charges of former chairman not supported by evidence

Three-quarters of a year of study, including the examination of 101 witnesses and 611 exhibits, resulted in the submission to Congress this week of two diametrically opposed reports on the virtues and vices of the Tennessee Valley Authority by members of the special joint investigating committee appointed last year.

The majority report, signed by Senators Donahey, Mead, Schwartz and Frazier, as well as Representatives Thomason and Barden, gives the TVA a clean bill of health. Its administration, the committee finds, has, "on the whole, been economical and efficient."

Charges Not Well-Founded

Charges brought by former chairman Arthur E. Morgan are dismissed as being not well-founded, and the retail rates set up for the sale of TVA power are found to provide "a legitimate, honest yardstick of equitable rates of private industry."

Sharp issue is taken with most of these findings in the minority report, signed by Senator James J. Davis and Representatives Jenkins and Wolverton. This report charges TVA with "waste and inefficiency" and with using methods characterized as "arbitrary, dictatorial and unbusinesslike." They recommend a complete reorganization of the agency, with river control functions to be returned to the Corps of Engineers, U. S. Army, and agricultural development to the Department of Agriculture, and various other activities to corresponding federal agencies. Power marketing, however, would still be handled by the TVA in a definite prescribed area provided such operations were subjected to the regulations of the Federal Power Commission and of the various state utility commissions.

The yardstick concept is condemned as "meaningless, . . . misleading, deceptive, unfair and dishonest." The investigation itself is termed inadequate, in that the committee failed to hear more than 50 witnesses, declined to permit cross-examination of its engineering staff, neglected to go into the recent purchase of Tennessee Electric Power Co. and other privately owned facilities, and fell short of a complete investigation in numerous other particulars.

The majority concluded that the committee accepts the conclusions that the TVA power program will be self-supporting and will make a material contribution to the costs of navigation and flood control.

The minority stated that the TVA rates will not yield revenue sufficient to pay annual operating expenses and interest. It suggested further study of the real cost of electric power generated and sold by TVA.

While the majority upheld the "yardstick," the minority said that the word "yardstick" should be stricken once and for all from the TVA vocabulary, since it "is a very grave misrepresentation."

Dr. Morgan was praised for his splendid work and given "credit for the efficient and economical construction work due to the engineering force as a whole, and particularly to Dr. A. E. Morgan." However, his charges against his co-directors, David E. Lilienthal and Dr. Harcourt A. Morgan, were "without foundation, not supported by the evidence and made without due consideration of the available facts."

The minority report stated that Dr. Morgan wanted the business of TVA conducted on the "highest plane of competency and integrity" and "objected to indirectness, concealment, manipulation and, indeed, all methods of carrying on the business of TVA which, while within the pale of the law, could not be justified by a high standard of fair dealing."

While the majority report upheld the TVA in practically all particulars, the minority took a more critical attitude.

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Business Drop Felt by Niagara System

The extent of the decline in industrial activity in the area served by Niagara Hudson Power System last year is reflected in the corporation's annual report. While the downward trend was reversed in the closing months of 1938, total energy sales were off 11.5 per cent, principally because industrial sales declined 23.9 per cent, Floyd L. Carlisle, chairman, and Alfred H. Schoellkopf, president, report.

Residential electric sales were up 4.8 per cent, whereas revenues increased only 1.5 per cent. Commercial energy sales increased 2.5 per cent and revenues were off 3.2 per cent.

During the year the system constructed 883 miles of rural distribution lines and at the end of the year had 14,704 miles in operation serving 42,562 farms and 150,144 non-farm customers in rural communities. The companies have completed approximately 94 per cent of the rural lines ultimately required to serve their franchise territory suitably for permanent agricultural use. The average cost to the farm customer was 4.08 cents per kilowatt-hour, as compared with 4.23 cents in 1937.

Taxes paid by the system companies again reached a new high during 1938, totaling $15,231,203, an increase of $648,027, or 4.4 per cent over 1937. The tax load per dollar of revenue increased from 16.7 cents to 18.5 cents in 1938. Over the past five years taxes have increased about 52 per cent.

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Officials Meet to Draw Contract for Utility Sale

Officials of the TVA and cities of Nashville and Chattanooga conferred this week with Wendell L. Willkie, president of Commonwealth & Southern Corp., on reducing to writing the oral understanding for the purchase of the properties of Tennessee Electric Power.

Present at the meeting with Mr. Willkie were J. A. Krug, engineer; J. L. Fly and Joseph Swidler, attorneys, representing TVA; L. J. Wilhoit, W. F. Chamlee, Phil B. Whittaker and S. R. Findley, Chattanooga power board representatives, and W. C. Cherry and James A. Newman, Nashville representatives.

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Free Power Plan Operative

The free electricity plan, similar to the offer made four years ago, has again been made available by the Wisconsin Public Service Corp. to customers receiving service under the residence, rural and commercial lighting rates. The plan permits customers to use unlimited amounts of electricity from April 1 until the June meter readings for a monthly charge not to exceed the amount of the March bill.

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Forms Memphis Unit

Memphis Generating Co. has been formed with 51,000 shares of $100 par value common stock, to take over the power plant and other properties of Memphis Power & Light which will not be sold to the city of Memphis and the TVA.

Illinois Against Plan of Public Ownership

Casey says State does not propose another "Little TVA" — Would sell surplus power

Announcing that application has been made to the Federal Power Commission by the State of Illinois for authority to construct one and possibly three power plants at existing dam sites along the Illinois waterway, Charles P. Casey, assistant director, Department of Public Works, explained that the State of Illinois does not propose another "Little TVA." He said that the state had no thought of promoting public ownership but, on the contrary, would sell this surplus power to private utilities.

Two purposes lie behind the request for permission to build plants at Brandon Road, Dresden Island and Starved Rock, or at all three points, Mr. Casey said. They are:

1. Protection of the rights of the state to construct power developments so that no private interest can have them.

2. Production of power for charitable and penal institutions, which now cost the state $100,000 a year.

In a statement regarding utility purchase of surplus power from the proposed state plants, two of which are within the area served by Public Service Company of Northern Illinois, President Britton I. Budd said: "It is our belief that the state, if it proceeds with this plan, will not have very much firm power over and above the amount necessary for certain state institutions. It is a logical development for the state, inasmuch as the dams are already constructed."

In applying to the Power Commission the Department of Public Works estimated the Brandon Road development would cost about $1,118,150 and produce 95,918,400 kw.-hr. annually, Dresden Island $1,579,929 and produce 57,818,000 kw.-hr. and Starved Rock $2,328,674 and 56,516,800 kw.-hr.

Although the State of Illinois reportedly does not purpose another "Little TVA," the law requires that communities along the route of the Illinois waterway be given an opportunity to bid for the surplus power.

The Sanitary District of Chicago will not take output of the proposed state plants, officials declare.

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Probes Plant's Services

New York Public Service Commission has instituted an investigation to inquire into the services, practices, methods and facilities of the municipal electric plant of the Village of Mayville, Chautauqua County, in extending and furnishing electric service outside the village. Hearing will be held in Buffalo on April 24.

COOKING EQUIPMENT—Hartford Electric Light Co. drew a selected attendance of more than 250 from hotel, restaurant and roadside stand representatives at its recent three-day display of more than $10,000 worth of electric commercial cooking equipment. Professional chefs prepared meals for groups of eighteen each during the show. Thirteen manufacturers co-operated in the display to boost sales

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Connecticut Utility Head Pleads Guilty to Charge

Viggo E. Bird, who recently resigned as president of Hartford Electric Light Co. and its subsidiary, the Connecticut Power Co., and from his official position with the New London Northern Railroad, pleaded guilty in Superior Court this week to charges of embezzlement and was sentenced to serve two to five years in state's prison.

Mr. Bird had been president of the two utilities since 1935 and was treasurer of the railroad, a line running from New London to Brattleboro, Vt. He was charged with using bonds worth about $160,000 and owned by the railroad company as collateral on personal loans from four banks.

Samuel Ferguson, chairman of the two Connecticut utilities, has been elected president. He will continue as chairman of each board.

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Insect Light Trap Book

The Miller Company, Meriden, Conn., has issued a booklet describing the Miller insect light trap and the many uses to which it can be put.

New Standard for Wires and Cables

Marking the first complete revision of these requirements since March, 1932, a new "Standard for Rubber-Covered Wire and Cables" was released this week by Underwriters' Laboratories, Inc.

Three grades of insulation are covered by the new standard: "Code," "performance" and "heat-resistant"; the former standard treated only the "code" grade. "Performance" grade is described as being higher with respect to aging properties and all-around performance than the "code" grade, while the "heat-resistant" grade is still somewhat higher than the "performance" grade, conforming to the "super-aging" grade of the federal specifications.

Another feature of the new standard is that it abandons chemical tests in favor of accelerated aging tests as more satisfactory and more nearly a performance test.

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Will Probe School Rates

Illinois Commerce Commission cleared the way for hearing on two complaints asking an investigation of electric rates paid by the Chicago Board of Education to the Commonwealth Edison Co., when it assigned the case for immediate hearing. The two petitions charge that the Board of Education has paid $4,281,760 too much for its electricity under a thirty-year contract with the company.

Southwest Group Announces Program

Southwest District meeting of the A.I.E.E. will be held at the Rice Hotel, Houston, Tex., April 17–19. At the general meeting on Monday morning, April 17, the address of welcome will be made by H. O. Clarke, Jr., vice-president Houston Lighting & Power Co.

At the technical session on Monday Seth Evans, Hughes Tool Co., will discuss "Electricity in an Oil Field Equipment Manufacturing Plant," and R. R. Miner, Kansas Gas & Electric Co., will talk on "Resonant-Type Constant Current Regulators." Later C. R. Hanna, K. A. Oplinger and C. E. Valentine, Westinghouse, will talk on "Recent Developments in Generator Voltage Regulation," and H. L. Reynolds, Allis-Chalmers, will discuss "Combines Voltage and Phase-Angle Control under Load." Others on the program include L. F. Kennedy, E. H. Bancker and F. M. Starr, General Electric; H. R. Vaughan and A. J. A. Peterson, Westinghouse.

There will be a symposium on "Electricity in Pipe Line Corrosion" and one on "Operating Experiences of Utilities with Rural Lines."

•

E.E.I. to Hold Convention in New York on June 6, 7, 8

The seventh annual convention of the Edison Electric Institute will be held June 6, 7 and 8 at the Waldorf-Astoria Hotel, New York City. The committee has requested that those planning to attend send in hotel reservations as soon as possible as the hotels expect a large attendance during the period of the New York World's Fair.

An elaborate program is being prepared for the convention this year. Many pressing problems of the industry will be discussed by utility leaders. Sessions are being scheduled at the fair site, where inspection tours will be made of the exhibit of the electric utility industry.

•

Arrange National Meeting to Inspect Steel Plant

The Detroit section of the Association of Iron and Steel Engineers will sponsor a national meeting of the association on April 19 for the purpose of inspecting the new coke plant and blast furnace recently completed by the Great Lakes Steel Corp. at Ecorse, Mich. Members and guests of the association will be transported from the Fort Shelby Hotel, Detroit, directly to the Great Lakes plant by a cavalcade of special buses.

In the evening a technical program will be held in the Fort Shelby Hotel, at which the new blast furnace and the new coke plant will be discussed. Preceding the technical program, an informal dinner will be held in the hotel. L. R. Milburn, electrical engineer, Great Lakes Steel Corp., will be chairman.

•

N.E.M.A. Plans Program for Annual Spring Meet

Announcement has been made that the National Electrical Manufacturers Association will hold its annual spring conference May 14 to 19 at The Homestead, Hot Springs, Va.

The board of governors will meet on Wednesday, May 17, and the codes and standards committee on Friday, May 19. During the convention the policy division will have an open meeting at which the topic discussed will be federal legislation. Various sections will also hold sessions.

•

Orders Rate Investigation

New Hampshire Public Service Commission has ordered an investigation of the rates, service and practices of the Concord Electric Co. The first hearing has been set for April 11.

MEETINGS

Missouri Association of Public Utilities—Annual convention, Muehlebach Hotel, Kansas City, Mo., April 12–14. Jesse Blythe, assistant secretary. Merchants Bank Bldg., 101 West High St., Jefferson City, Mo.

Maryland Utilities Association—Spring meeting, Lord Baltimore Hotel, Baltimore, Md., April 14. Warren D. Haley, secretary, 16 Carroll Ave., Takoma Park, Md.

American Institute of Electrical Engineers—Southwest district meeting, Houston, Tex., April 17–19. North Eastern district meeting, Springfield, Mass., May 3–5. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Northwest Electric Light and Power Association—Engineering and operation section, Seattle, Wash., April 19–22; accounting and business practice section, Vancouver, B. C., May 26–27. Berkeley Snow, secretary, 707 Spalding Bldg., Portland, Ore.

Electrochemical Society—Spring convention, Columbus, Ohio, April 26–29. Dr. Colin G. Fink, secretary, Columbia University, N. Y.

Edison Electric Institute—Engineering committees meetings, Edgewater Beach Hotel, Chicago, Ill., May 1–4. Bernard F. Weadock, managing director, 420 Lexington Ave., New York, N. Y.

National Electrical Manufacturers Association—Spring conference, The Homestead, Hot Springs, Va., May 14–19. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

National Electrical Wholesalers Association—Annual convention, The Homestead, Hot Springs, Va., May 22–25. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

Select Three Judges for Prize Pix Test

Entries in ELECTRICAL WORLD's Prize Picture Contest for utility employees are assured of competent estimation of their qualities in every aspect. This may be counted on from the qualifications of the three men who have agreed to act as judges. One is Harry Hall Frayzur, contributions editor of *Life*. It is Mr. Frayzur's daily job to look over pictures that come floating in from all over the world and to pick out the few that are worth printing. To estimate the significance of entries and their value so far as the electric utility industry is concerned, there is Howard F. Weeks, president Public Utilities Advertising Association. Mr. Weeks, who is assistant director editorial bureau, Consolidated Edison Company of New York, has a comprehensive background of utility advertising and publicity. The third judge is Keith Henney, editor of *Electronics*, editor also of a new McGraw-Hill magazine, *Photo-Technique*, which will make its bow in May, and author of "Color Photography for the Amateur."

It is felt that the capacities and experiences of these three men fit them admirably for the particular job of judging pictures submitted in this contest. The purpose of the contest is more than just to find pictures of fine composition. It is to find pictures that by bringing out the romance in this industry contribute importantly to a better public understanding and appreciation of the electric utility service.

•

LaPierre and Mansfield Win A.I.E.E. Competition

C. W. LaPierre of General Engineering Laboratory and A. P. Mansfield of the industrial department, General Electric Co., have been announced as winners of the competition sponsored by the northeastern district of the American Institute of Electrical Engineers for the best papers submitted during 1938.

The paper was entitled "The Photoelectric Weft Straightener Control." The prize will be awarded at the next meeting of the organization.

•

Agree to Bond Extension

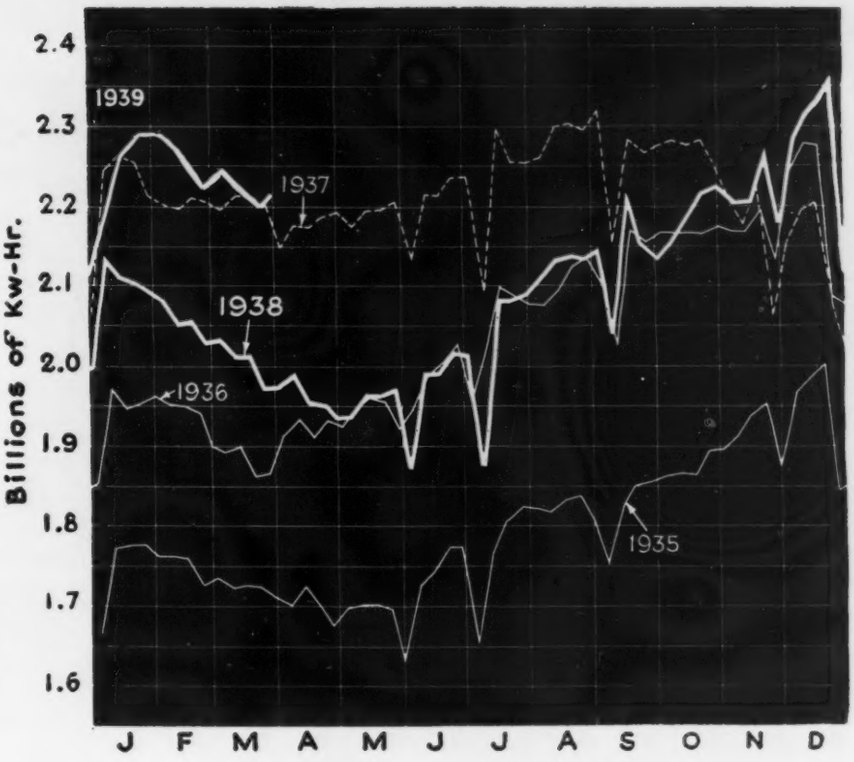
Holders of approximately 69 per cent of the refunding and extension mortgage 5 per cent gold bonds of the Laclede Gas Light Co. have agreed to the plan to extend the bonds until 1942, E. L. White, secretary of the company, has announced.

Output Regains Lead Over Other Years

Turning upward, compared with the preceding week, the production of energy by the electric light and power industry during the week ended April 1 rose 11.7 per cent above the corresponding figure a year ago to 2,209,971,000 kw.-hr., according to the Edison Electric Institute.

The gain over 1938 is the largest thus far recorded. Moreover, the excess over 1937, the previous high year, has increased to 2.9 per cent after shrinking to zero a week ago. The favorable showing is due in part to a sharp dip at the beginning of April, 1937. However, it will be noted that the output is nearer the January peak than it was that year—off 82,000,000 kw.-hr. against 117,000,000 kw.-hr.

In the Central Industrial area the margin over 1938 has risen to 15.3 per cent, a new high. Gains are being held in other regions except the West Central, where reduced percentages are to be viewed against reduced losses a year ago, compared with 1937.



Weekly Output, Millions Kw.-Hr.

1939		1938		1937	
Apr. 1	2,210	Apr. 2	1,979	Apr. 3	2,147
Mar. 25	2,199	Mar. 26	1,975	Mar. 27	2,200
Mar. 18	2,225	Mar. 19	2,018	Mar. 20	2,211
Mar. 11	2,238	Mar. 12	2,015	Mar. 13	2,213
Mar. 4	2,244	Mar. 5	2,036	Mar. 6	2,200
Feb. 25	2,226	Feb. 26	2,031	Feb. 27	2,207

Per Cent Change from Previous Year

	Week Ending		
	Apr. 1	Mar. 25	Mar. 18
New England	+14.3	+14.7	+12.3
Middle Atlantic	+ 9.8	+10.9	+ 8.0
Central Industrial	+15.3	+12.9	+12.8
West Central	+ 1.9	+ 3.2	+ 7.0
Southern States	+ 8.8	+ 8.1	+ 6.2
Rocky Mountain	+ 9.0	+ 8.7	+ 9.3
Pacific	+9.9	+12.9	+ 9.4
United States	+11.7	+11.3	+10.3

Federal Power Plan Major Utility Problem

Groesbeck says coordinated use of facilities offers solution—Sees plan aiding recovery

Achievement of the objective of the widest possible use of electric service at the lowest possible economic cost lies in the co-ordinated use of the generating and transmission facilities of the existing private utility companies and the federally financed power projects, C. E. Groesbeck, chairman of Electric Bond & Share Co., declared in the annual report to stockholders.

Mr. Groesbeck stated that the problems raised by the federal power program are the most pressing now confronting the industry and its investors.

"It is to be presumed that the objectives of both government and the utilities must be the widest possible use of electric service at the lowest possible economic cost," Mr. Groesbeck told the stockholders. He declared that his company believes that the achievement of this and the solution of the existing problems of competition lie in co-operation between the government and the privately owned electric utilities and the co-ordinated use of the existing generating and transmission facilities of both.

"We believe that such a program would go far beyond the direct benefits which should accrue and would be helpful in encouraging general business expansion and increasing employment," he declared. He said that Electric Bond & Share, with its extensive systems of first class utility properties, can contribute in a special way to any such construction program.

Mr. Groesbeck stated in the report that the company will do anything in its power to bring this about and to co-operate fully in any such program, believing that by pursuing this course it can best serve the stockholders' interest.

Reviewing the rapid growth in the government's power program in recent years, Mr. Groesbeck pointed out that projects to which federal funds have been granted or allotted and which are competitive with the privately owned utilities now number more than 140. These projects, he said, together with other projects financed in whole or in part by federal funds and scheduled for development, represent ultimate installed capacity of 7,300,000 kw., equivalent to 20 per cent of the entire privately owned utilities. He pointed out how these projects had adversely affected the earnings and the values of properties of the operating companies in which Electric Bond & Share has investments.

The company earned 18 cents a common share in 1938, as against 42 cents a share in 1937.

•

81% of Farms Served

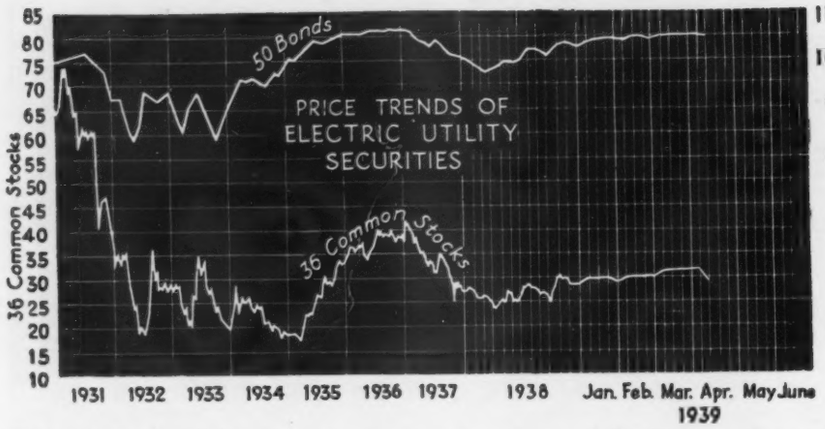
President C. L. Campbell of the Connecticut Light & Power Co. reports in a statement to stockholders that electric service is now available to 81 per cent of the farms located in the company's territory.

•

Knoxville Bonds Sold

RFC has sold to Fox, Einhorn & Co., Cincinnati, Ohio, and Associates, $214,000 city of Knoxville, Tenn., 4 per cent electric light and power system bonds at $1,081 per $1,000.

Stocks and Bonds Drop in Week


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
50 Bonds
1931 1932 1933 1934 1935 1936 1937 1938 Jan. Feb. Mar. Apr. May June 1939

Utility stocks shared the decline in the general market on last Tuesday, and for the week the "Electrical World" index was off 1.4 point to 29.2, lowest since the week ended December 31, 1938. Bonds, too, were off, with the index down 0.6 point to 104.3

Standard Gas Fights Tax on Securities

Standard Gas & Electric Co. has filed suit in Superior Court to keep County Collector John Toman from collecting personal property taxes assessed against it. This company on April 1 moved its headquarters from Chicago to New York City because of the Illinois personal property tax.

The current suit filed for the company by Attorney Michael J. Ahern said Mr. Toman is attempting to collect a personal property tax of $618,845 based on an assessed value of $6,786,683 and a full value of $18,331,130. Company claims its personal property tax should be $33.74, based on a full value of $1,000 for office furniture and fixtures. It claims that securities it holds in its portfolio are not located in the state and are not in the possession of any Illinois resident.

It is alleged by the company that imposition of a personal property tax on intangibles, stocks and bonds violates the Constitution of Illinois and the Fourteenth Amendment of the United States Constitution.

Bernard W. Lynch, president of the company, said recently that the company would prefer to remain in Chicago and would consider moving its headquarters back to Chicago from New York if the Illinois personal property law were changed.

•

Capital Reduction Denied

New York Public Service Commission has denied a petition of the Rochester Gas & Electric Corp. for approval of a certificate of reduction of capital pursuant to the provisions of the stock corporation law. The corporation proposed a reduction of its capital from $38,207,308 to $35,270,308.

•

Cities Service Co. to Segregate Units

In a move designed to avoid regulation under the Public Utility Holding Company Act, Cities Service Co. has formulated a plan to divest itself of direct working control over its widespread utility properties.

Under the terms of the plan, which shareholders will be asked to approve at their annual meeting on April 25, the company proposes to turn over to independent trustees all of the common stock and an undivided 10 per cent interest in the preferred stock of Cities Service Power & Light Co. Voting rights on all of the preferred and common shares held by Cities Service in its utility subsidiary will also be relinquished.

Cities Service Power & Light stock, amounting to 600,000 shares of common of $100 par value and 121,854 shares of preferred, is to be pledged with the trustees under an indenture, the terms of which provide that all such stock shall be used for the purpose of securing all of the outstanding debenture debt of the Cities Service Co., currently aggregating about $180,000,000. Current dividends received by the trustees on the Cities Service Power & Light stock are to be used to pay the interest requirements on the debentures. In addition, all liquidating dividends and the proceeds from the sale of any of the common or preferred stock are to be used to retire the debentures.

The move proposed by Cities Service would segregate petroleum interests from the utility investments, and if approved by the SEC would remove present restrictions under the utility act from the oil properties.

•

Abitibi Files Bonds; SEC Registrations

Abitibi Power & Paper Co. has filed a registration statement with the SEC covering $48,267,000 first mortgage gold bonds, series A, 5 per cent, due 1953, certificates of deposit. The statement was filed by the bondholders' committee.

Other declarations filed with the commission follow:

Southern Utah Power Co. in connection with the issuance of $99,000 of first mortgage 5½ per cent sinking fund bonds, series A. Proceeds are to be used for additions and improvements to the company's electrical properties. The bonds are to be sold at 92.

Consolidated Gas, Electric Light & Power Co. of Baltimore has filed an amendment with the SEC naming the underwriters who will participate in its issue of 223,063 shares of 4½ per cent series B cumulative preferred stock, $100 par value. The underwriters will take the stock which is not issued and exchanged by stockholders for the company's outstanding 5 per cent series A preferred. The underwriters number 32.

Portland General Electric Co. and Portland Electric Power Co., both of Portland, Ore., have filed notification of registration under the Holding Company Act. The commission has issued an order consenting to the withdrawal of the applications of these companies for exemption from the provisions of the act.

•

Broadens Appliance Rule

SEC has announced the adoption of amendments to Rule U-3D-9 under the Holding Company Act, which exempts from the declaration requirements of the act the indorsement or guarantee by a public utility company of installment paper received from customers in connection with the sale of appliances.

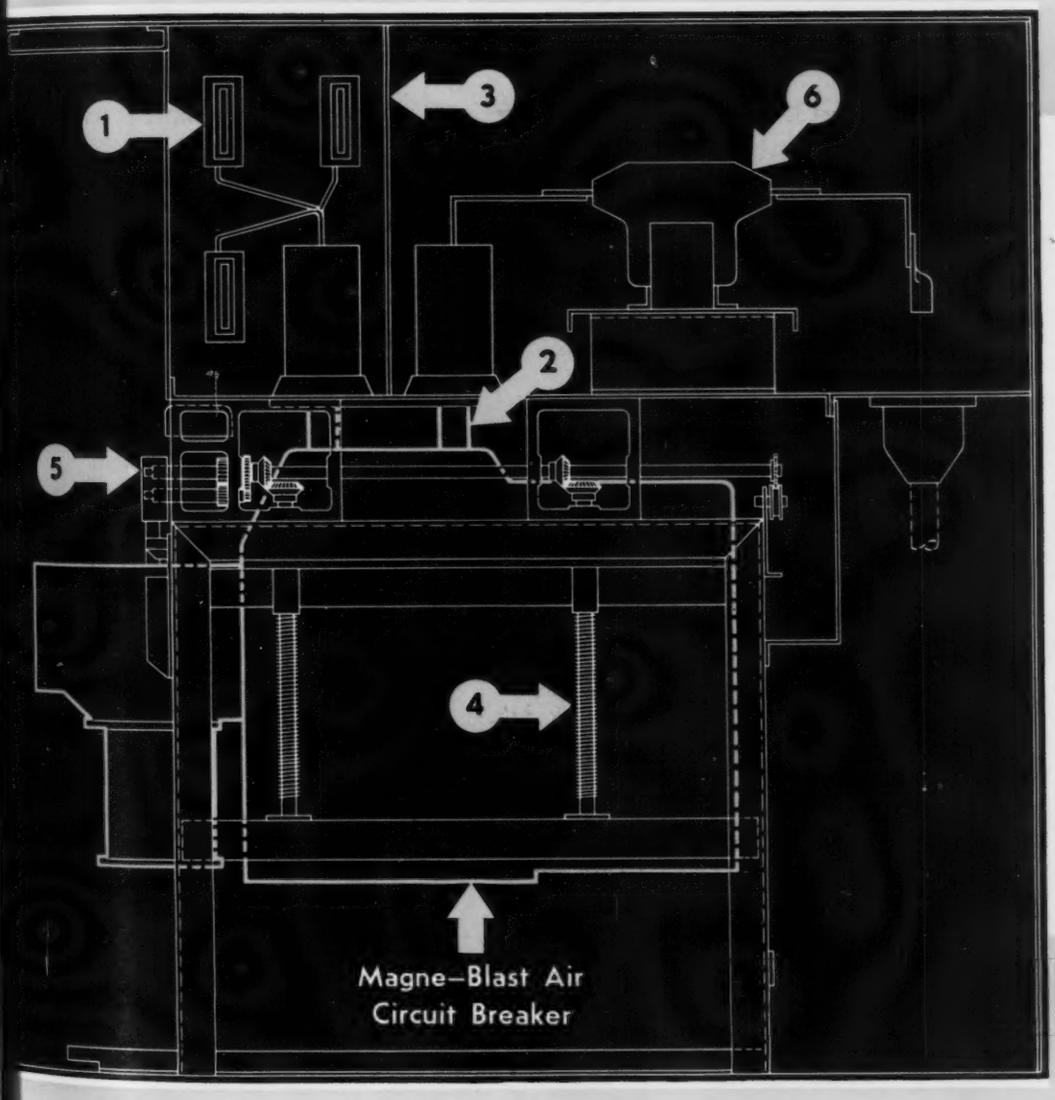
Utility Reports

	Net Income 1939	1938
*Alabama Power	$3,584,746	$3,654,629
*American G.&E. & subs.	12,486,490	13,181,943
*Commonwealth & Southern and subs.	12,802,084	14,077,320
*Consumers Power	8,863,029	9,891,212
*Eastern Util. Assoc.	1,637,661	1,557,741
*Georgia Power	4,868,861	4,590,709
*Kansas City Pwr. & Lt.	3,702,454	4,375,056
*Northern Ind. Pub. Serv.	1,923,359	2,146,550
*Ohio Edison	3,844,750	4,495,223
*Tampa Electric	1,491,002	1,482,063
*Tennessee Elec. Pwr.	1,222,105	1,097,760
*Washington Water Pwr.	2,568,471	2,684,525

*Twelve months ended February 28.

with MAGNE-BLAST BREAKERS

including all vertical-lift master metal-clad features and the time-tested arrangement of circuit components



Not one of these features is sacrificed:

(1) High-dielectric, molded bus insulation

(2) Standard high-pressure disconnecting devices

(3) Complete circuit isolation

(4) The time-proved breaker-elevating mechanism

(5) The dependable, direct-acting mechanical interlocks

(6) Current transformers that are properly coordinated

(7) Silver-to-silver contacts throughout

(8) Semiflush mounting of instruments and relays

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GENERAL ELECTRIC

880-37

OPERATING PRACTICES

Winch-Powered Reel Speeds Stringing

By J. B. BOWEN
San Diego Consolidated Gas & Electric Company, San Diego, Cal.

Extensive rebuilding of the primary system in the city of San Diego has made it necessary to provide speedier and more efficient methods for stringing and taking down wire. The three-compartment reel shown, truck-mounted and chain-driven from the truck's winch, has been devised to speed the handling of running lines in stringing operations and the salvaging of wire that is being removed. A time check on one removal job in which the reel was used showed that only twelve minutes was required to remove five blocks of single-conductor No. 2/0 wire through a district of heavy traffic, and on several recent stringing jobs a speed of 150 ft. per minute was maintained when pulling three No. 4/0 wires.

In stringing wire practice had been to take through one running line of about 1,200 ft. which was carried in the form of a loose coil. Several wires could be attached to the running line and pulled back, but if one or more of the wires were on the opposite side of the arm it was necessary to take the running line through a second time. It was to meet this problem that the reel was built.

The reel is about 5 ft. in diameter and three ft. wide. It is made of 1-in. pipe for the spokes and ½-in. pipe rim. A hole is provided in the end plate for engaging the finger on the driving axle. Each of the three compartments of the reel holds 1,250 ft. of ¾-in. running line, but will accommodate more rope if needed.

The reel is supported on jacks. Its diameter was selected so that only a few turns of the jacks would be needed to lower the reel to the bed of the truck for removal.

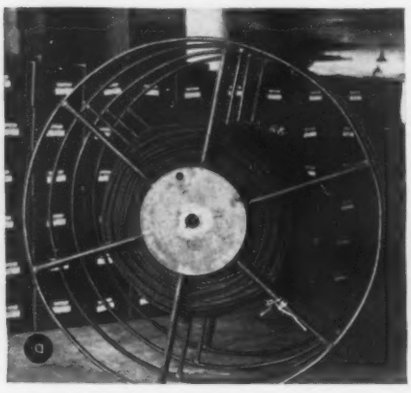
Drive equipment consists of a model G-740 White winch operated by a Spicer power take-off. A crank attached to the reel drive sprocket carries a sliding collar on which is the finger for engaging either the running line reel or an empty wood reel for reeling in wire.

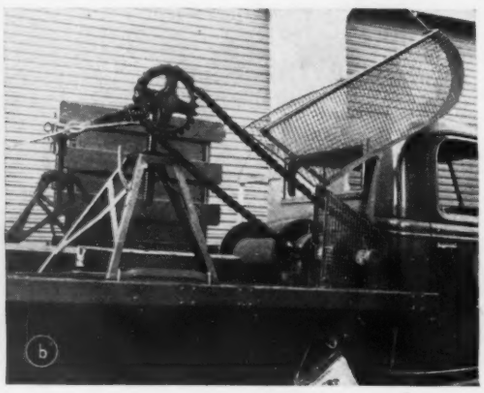
On heavy pulls, where there is danger of the reel overturning, the reel stand is guyed temporarily to the rear of the truck.

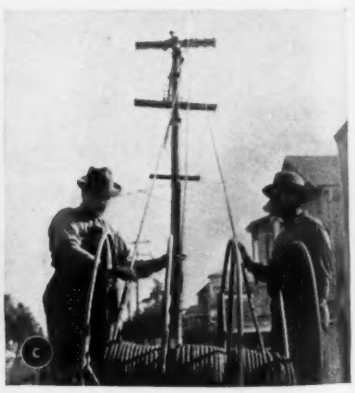
Inasmuch as there is not sufficient work to keep the truck busy every day, the reel stands are mounted with U-bolts so that all equipment may be removed in about 30 minutes and the truck released for other work.

When the equipment is used to drive a wooden reel in salvaging wire that is being taken down two

Truck-mounted reel speeds wire stringing and salvage
(a) Reel in store room with running line wound on.
(b) Chain and sprocket power take-off attached to truck winch. Note removable U-bolts for holding reel stand, also chain guard.
(c) Three-compartment reel in operation pulling in wire.
(d) Wooden reel replaces pipe reel for salvaging wire.







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men inspect the wire for burns and abrasions in the weatherproofing, which are taped as it is reeled in. This field inspection eliminates any further work in the storeroom or by salvage crews.

•

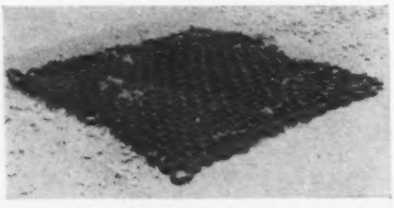
Blast Protector Mats Make Old Rope Useful

By F. S. PARTRIDGE
Construction Superintendent
Oklahoma Gas & Electric Company

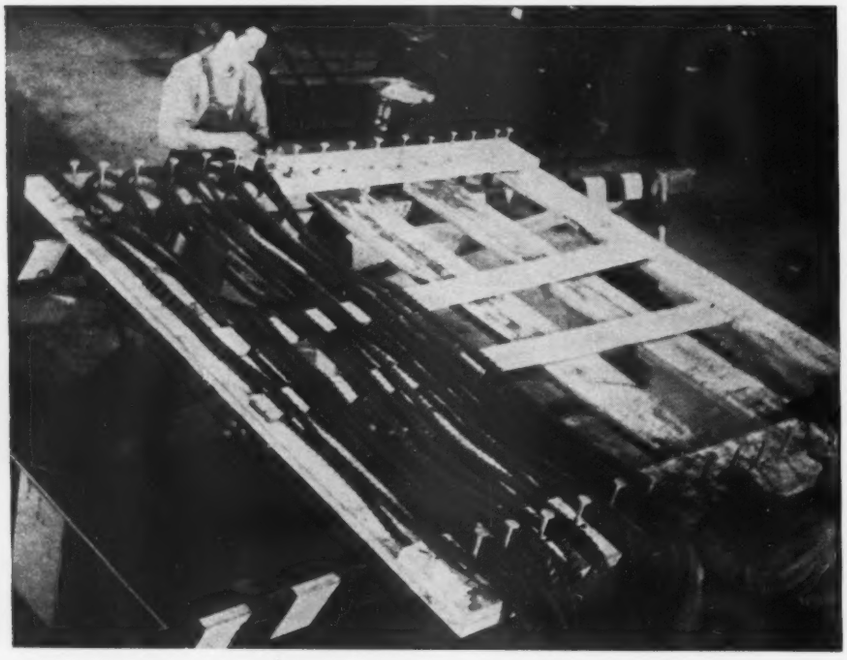
We often have to resort to the use of explosives in excavating pole holes where rock or hard shale is encountered. In the vicinity of highways, urban districts and farm houses the hole must, of course, be covered, prior to detonating the charge. We have used several different methods of covering, but have found a heavy mat, woven out of rope, to be the most effective and convenient cover.

The mats are woven out of old, unusable short lengths of 1-in. or 1¼-in. rope, into approximately an 8 x 8-ft. size. No particular skill is required in making the mats and this work is generally done by laborers or semi-skilled workers at odd times, in order to keep a supply of two or more of the mats on hand for future use.

The use of rope mat covers in blasting work is not new, nor do we think that it is original as far as our company is concerned. We do feel, however, that their use has a decided economical advantage in that in this way old manila rope, unsafe and unfit for other purposes is made useful.

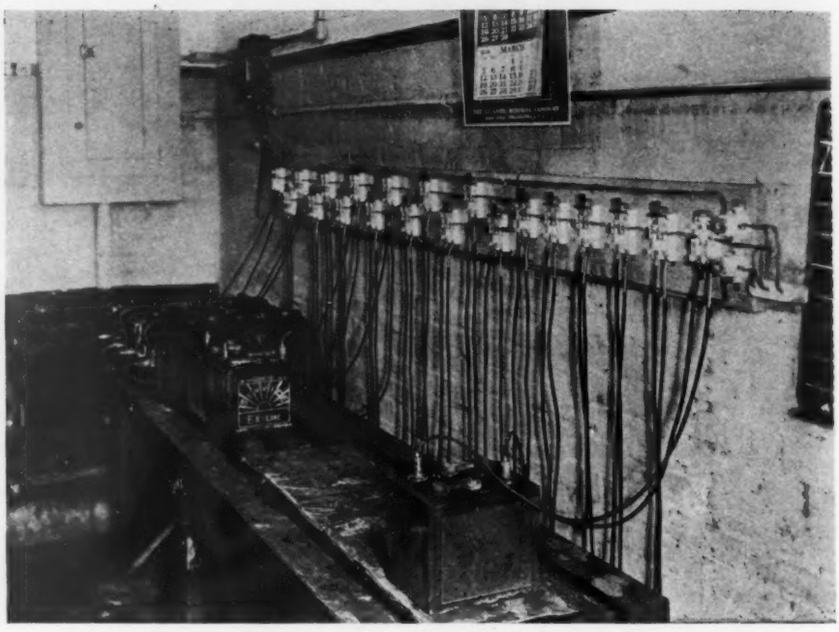


Rope mat for blast protection



Weaving the mat

Battery-Charging Panel



Narragansett Electric Company, Providence, R. I., can charge 20 truck batteries simultaneously from the switch layout shown at the Melrose service station. Direct current is obtained from a Tungar rectifier set at the right (not in view). The left section of the board provides for charging at a 6-amp. rate and the right section at a 12-amp. rate. The two 6-amp. circuits are put in parallel for delivering the 12-amp. supply.

Check Up on Film Cutouts

By R. L. BIESELE, Jr.
Westinghouse Electric & Manufacturing Company, Lighting Division,
Cleveland, Ohio

Proper operation of the film cutout, frequently dismissed as an almost negligible item, is essential to the safe and satisfactory operation of the series street-lighting circuit. The film cutout should function as follows:

1. It should act as an insulator as long as the lamps are in operating condition.
2. It should break down immediately upon failure of the lamp, thus insuring continuity of the series circuit.
3. The short circuit established by the broken down film cutout should be positive and permanent and the voltage drop across it must be negligible.

Improper operation of the film cutout produces a number of troubles frequently blamed on other pieces of equipment. The most likely type of improper operation, however, is incomplete breakdown, which causes the cutout to act as a resistance in the series circuit, causing undue heating of the receptacle prongs and contacts and resulting in loss of temper and poor contact. Partial breakdown of the cutout is usually characterized also by arcing inside the cutout as it

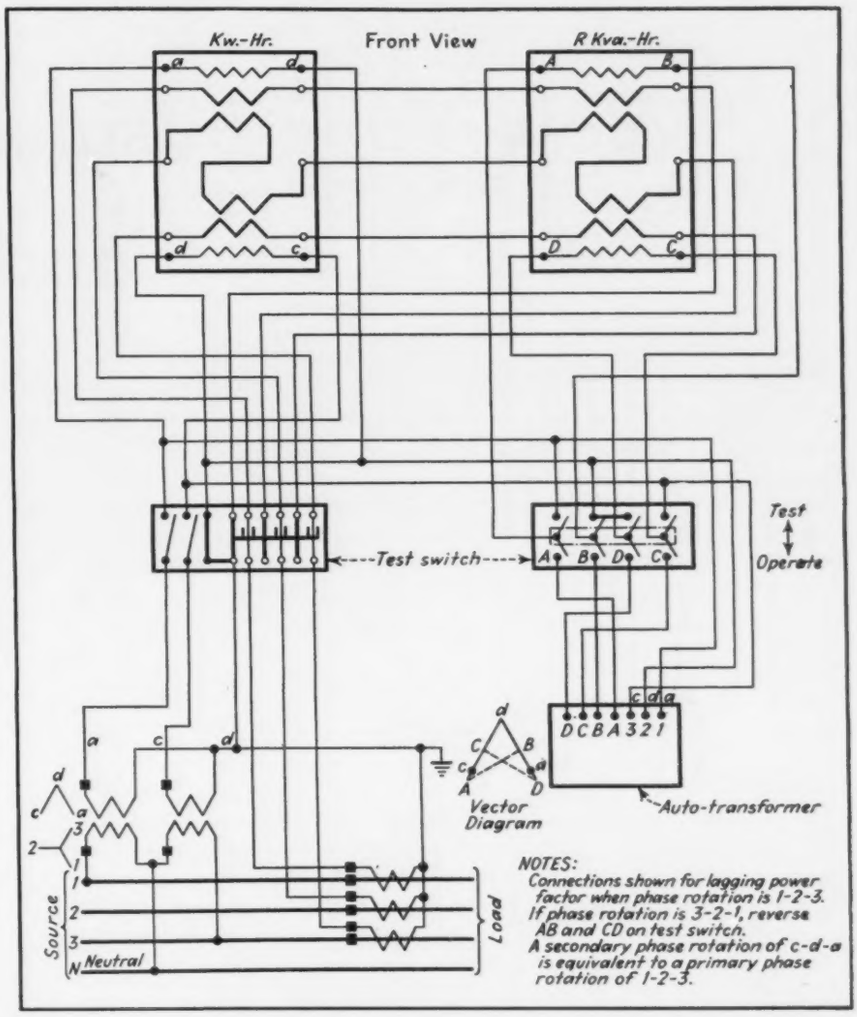
alternately becomes an insulator and is broken down again. This arcing is, of course, a potent source of radio and telephone interference.

Comparative tests of various types of film cutouts are very easily made. By arranging a series socket with the short-circuiting bar insulated, so that removal of the lamp from the socket will open the series circuit, the film cutout being tested will be broken down without injury to the lamp. By holding the ear close to the socket the arcing inside a partially broken-down cutout can be distinguished as an irregular ticking sound. On removing the socket from the receptacle a minute to two after the cutout has been broken down the prongs will be too hot to touch if the breakdown has been incomplete. The prongs should be only slightly warm if the cutout has operated properly.

More elaborate tests can be made using a voltmeter to determine the voltage drop across the broken-down cutout and a thermocouple to measure the temperature rise of the socket prongs. The simple test, however, is sufficient to demonstrate the importance of proper cutout operation. The test should be made on the secondary of an isolating transformer, to eliminate the hazard of the high voltage on a straight series circuit.

•

Use Split Coil Meter On Balanced Loads



Entirely practical on balanced loads, but admittedly inaccurate on unbalanced loads under some conditions, the use of two-element, four-wire delta "split coil" meters for metering three-phase, four-wire wye services, though not general, has been employed for a number of years by the American Gas & Electric Company. The method assumes balanced voltages and for such conditions practical field tests have shown the method sound. The three-element, four-wire meter is used on this system only when the conditions of load are such as to cause unbalanced voltages that would affect the meter accuracy to the extent of 1 per cent or more. Use of the split-coil, two-element meter method, as shown, makes possible considerable savings in the applied cost of meters.

Foreign Experience With Petersen Coils

Petersen coils greatly improved operation on 40-kv. and 80-kv. lines of the Victoria Falls and Transvaal Power Company, Ltd., according to a synopsis of a paper by E. F. Rendell, system operation engineer of the company, in The *Electrician* (London). The maximum power demand on the companies' system exceeds 530,000 kw. and the lines operate in one of the most severe lightning regions in the world, trouble being experienced from lightning storms about eight months of the year.

The initial and experimental installation of the coils was on the company's 40-kv. system, and voltage recorders were installed on the lines to provide information of the phases affected by faults. Operating the 415-mile system alternately on the Petersen coils and on grounded neutral for a fortnight at a time records for 343 days on each method were obtained, giving the following results.

The coils eliminated: (1) 27 per cent of the fault trips during storms; (2) 52 per cent of the fault trips during good weather; (3) 35.8 per cent of the total fault trips.

Due to the fact that 154 miles of the system were single supply circuits, with ground-leakage protection, and a low operating setting, Rendell felt that trip-out on these lines occurred even though the fault were suppressed, and that, making allowance for this fact, the reduction in total trips due to the Petersen coils was about 58.6 per cent rather than 35.8 per cent.

Installation of these coils included an automatic switch to short circuit the coils and revert the system to grounded neutral in case of a fault sustained for one second.

Comparison between the 80-kv. and 40-kv. records for Petersen coil operation showed that three-phase-faults were practically unknown at the higher voltage, while on the 40-kv. system 41 per cent of all faults were of a multi-phase nature.

Know Your Business

and TELL IT

WHAT'S THE MOST EFFECTIVE WAY to bring down the cost of electricity? Reduce rates? That's what most everybody thinks. But it isn't so. There's another and a better way that has done, and will do, more to reduce the cost of electricity to the people of the United States than all the rate reduction orders that have been written or ever will be. This better and more effective way is to increase the use of electric service. The pictograph opposite shows the condition for last year, 1938, when increased use of electricity did three times as much as rate reduction to lower the cost of electric service to the homes of this country.

Rate reduction is shown by analysis of statistics (ELECTRICAL WORLD, January 14, 1939, page 88) to have accomplished probably only about 25 per cent, certainly not more than 40 per cent, of the decrease in unit cost of electricity for domestic service between 1937 and 1938. If the 1938 domestic usage of electricity had been paid for at the average 1937 unit cost, the total 1938 bill would have been $35,000,000 more than it actually was. This sum of dollars represents the saving to consumers resulting from decreased cost of electricity in one year. And of this saving only about $9,000,000, certainly not more than $14,000,000, can be credited to rate reduction, leaving $21,000,000 to $26,000,000 for which increased use of service is responsible.

Now, why is this? People don't use more electricity just because they like to. Rather, the general disposition is directly contrary; people mostly try to save on electricity. But they do use more and more all the time. Why? Because they want more and more of the services, the conveniences, the comforts that greater use of electricity will give them. And what did that? Sales promotion did it—manufacturers, dealers, utilities, all working for an honest profit, telling, persuading the great American public that an electric home is a better home to live in.

As people buy and use more electric ranges, refrigerators, water heaters, toasters, washing machines, flat irons and the numerous other domestic appliances available, the lower steps of rate schedules play a larger part in determining the over-all price per kilowatt-hour, bringing it down to a lower level. This factor, according to the evidence of the 1937–38 data, was the reason for from 60 to 75 per cent of the saving to customers last year. This proves, in electric service as in every other business, that selling effort does much more than cutting prices to give the buyer more at lower cost.

Rate reduction is a pulling down. Increasing the use of electric service is a pushing up. Haven't we had enough pulling down in recent years? Isn't it about time to give more attention to pushing up? Think it over and talk about it.

NEW ENGINEERING IDEAS

Outdoor Switchgear for Fire Protection

A rather unusual outdoor arrangement of generator main and auxiliary buses, switching, reactor and transformer equipments has been installed at station A of the Northmet Company at Brimsdown, Middlesex, England, to protect against repetition of the serious explosion and fire that occurred there in 1935.

As shown on the accompanying diagram from the *Electrical Review* (London), duplicate 33-kv. busbars, each with associated breakers, are separated at the center by a reinforced concrete aisle which comprises two parallel longitudinal walls, 21 ft. 6 in. high, 6 in. thick and 17 feet apart. These walls form an effective fire barrier so that one set of busbars and its breakers are regarded as a genuine standby to the other.

In addition to acting as a fire division the aisle has transverse partitions which extend to within 8 ft. of the ground, forming compartments which accommodate the breaker-selection and circuit-isolating switches and also the cable sealing ends. With a circuit in operation on the main bus, for example, its auxiliary busbar breaker is screened by the wall of the aisle from the live connections.

Potential transformers are fitted to alternate sides of the concrete aisle, thus providing twice the bay center dimension between transformers, a distance of 32 ft.

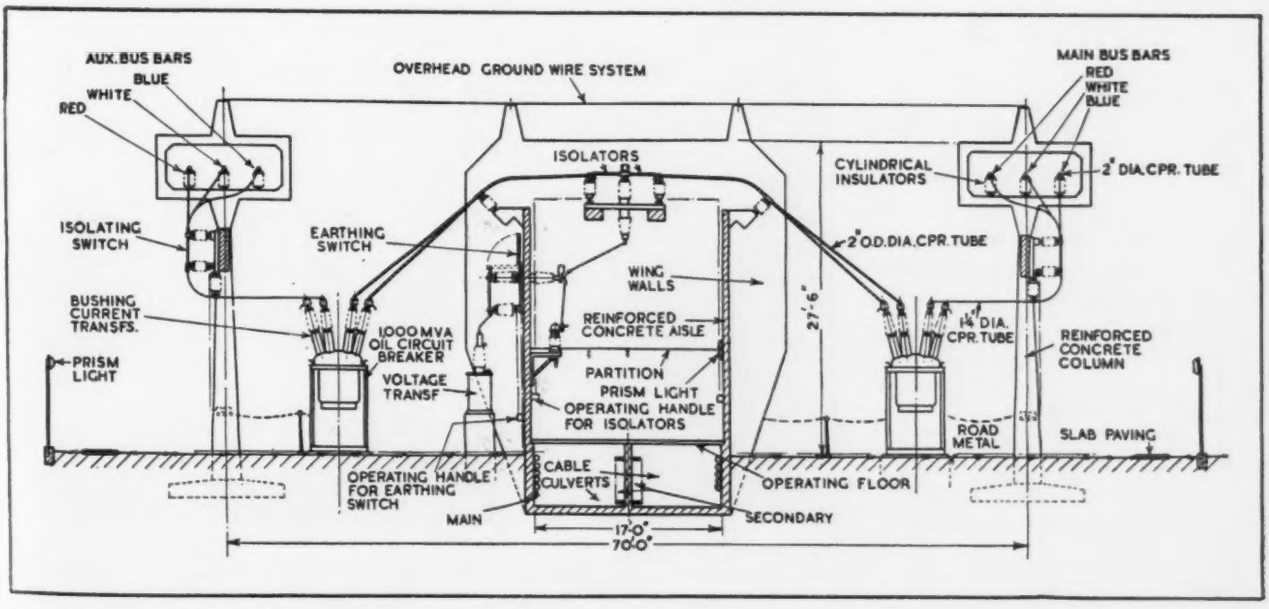
The base of the aisle forms a cable culvert, divided by a center wall. As one-half of the cables in each section can be brought out at either end of the structure, the cables can be divided into four distinct groups, with alternate circuits run in different halves of the culvert and surrounded with sand and shingle.

The busbars are of 2,000 amp. capacity mounted on 3-ft. centers on cylindrical porcelain insulators, supported from a reinforced concrete frame at the head of a concrete column. Bar lengths correspond to the bay centers of 16 ft.

Isolating switches are of the single-break rotating blade type, the blade moving in a direction at 90 deg. to the axis of the insulator. This type was chosen because of its mechanical simplicity and the relatively high impulse strength of one single break compared with two equivalent breaks in series, as on a center break rotating post type.

The circuit breakers have a rupturing capacity of 1,000,000 kva. at 33 kv. Tests at 100 per cent 60, 30 and 10 per cent rating gave a total break time of less than 5 cycles down to 30 per cent of rating.

Protection against direct lighning strokes was obtained by a network of overhead ground wires, carried on pinnacles at the top of the reinforced concrete structures.



Outdoor station switchgear arrangement has fire protection features

Plates Silver in the Field

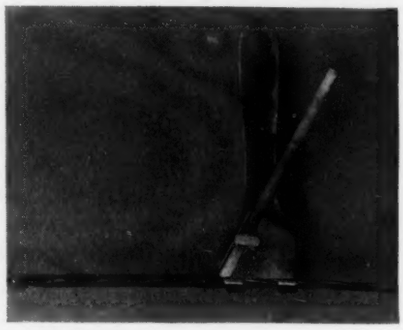
This portable silver-plating device, whereby the plating is applied by brushes, is one of the handiest gadgets used at the Buffalo Niagara Electric Corporation's service building and Huntley steam station. In the field the outfit is carried in the back of a truck and powered by batteries and is used for plating contacts on outdoor high-tension switches to provide low-resistance, non-oxidizing contact areas. It is also used for silver plating copper on busbars and on current-carrying contacts for oil and air circuit breakers and on the jaws of disconnecting switches.

Simple Tool for Wrapping Conductor

By E. D. FREEMAN
Superintendent Transmission and Distribution
Oklahoma Gas & Electric Company

In adopting the practice of wrapping certain classes of conductors with metal ribbon at the point of support, we encountered difficulty in getting the metal ribbon wrapped tight enough by hand to conform to the contour of the conductor.

A tool was developed for the application of this copper ribbon. It is applicable to both stranded and solid conductor of the same diameter, using a ribbon of fixed width and thickness. The over-all length of this tool is 7 in. and it is carried on the lineman's belt in the same manner as wrenches or other tools. The same principle can be applied for any width or thickness of ribbon.



Conductor-wrapping tool

Roasters Facilitate Bearing Assembly

As a substitute for forcing ball bearings home in assembling them on the shafts of electric motors, yet still maintaining the close fits required, the assembly department of the Reliance Electric & Engineering Company, Cleveland, recently devised a simple yet effective method of heating the bearings to expand their inner races and so permit their being slipped easily to their seats on the shafts.

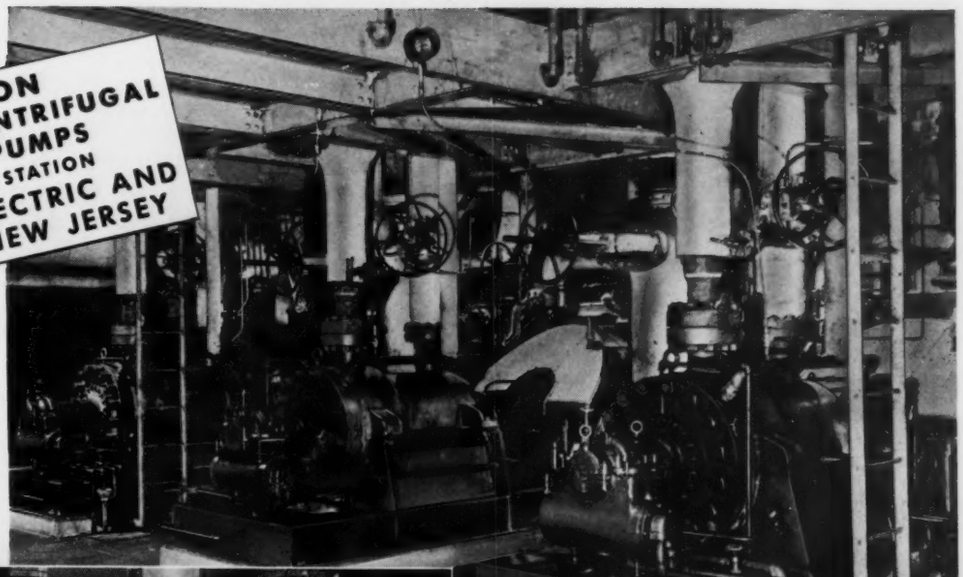
Tests conducted in the company's experimental laboratory to determine heating time and temperature indicated that a large bearing, for a certain temperature, expanded more than a smaller bearing, or, in terms of fit, the large bearing had more clearance than a small bearing at the same temperature. On the other hand, it took longer to bring a large bearing up to temperature. This combination made it possible to keep both small and large bearings in small electric ovens for the same length of time (around two hours), getting approximately the same diametral expansion, and essentially the same clearance for assembly.

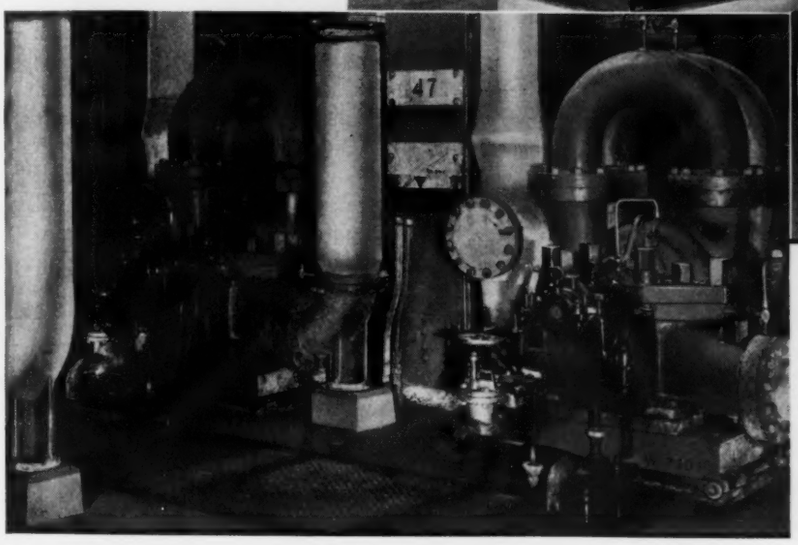
Small kitchen type electric roaster ovens were bought because they were the cheapest (around $15 each) and still the most convenient for the use required of them.

The ovens are set and maintained at 225 deg. F. by thermostatic control. This temperature was selected as the maximum for safe use.

New use for the roaster
These simple kitchen roasters operate at 225° F. to heat medium-sized ball bearings sufficiently to facilitate their assembly on motor shafts. The time required for each batch of bearings is two hours or less.

WORTHINGTON
HIGH PRESSURE CENTRIFUGAL
BOILER FEED PUMPS
ESSEX GENERATING STATION
PUBLIC SERVICE ELECTRIC AND GAS COMPANY, NEW JERSEY





Above—Three 6" 6-stage Worthington Boiler Feed Pumps, steam-turbine-driven, capacity of 650,000 lb. per hr. each . . . 200 p.s.i. suction pressure and 1765 p.s.i. discharge pressure, 220° F., 3570 r.p.m.

Left—Two of three 6" Worthington Boiler Feed Pumps, motor-driven, capacity of 650,000 lb. per hr. each . . . 200 p.s.i. discharge pressure, 220° F., 1750 r.p.m.

A steadily growing list of important users gives evidence of sustained confidence in Worthington high pressure centrifugal pumping units.

In every case the high initial efficiency of these units is being steadily maintained because Worthington has always built to the principle that the only real economy can be obtained by producing equipment that will continue to give high operating efficiencies and assure uninterrupted performance through successive years of service.

The complete Worthington line of Centrifugal Boiler Feed Pumps covers without compromise every condition, from the smallest capacities and medium pressures, to the largest high pressure units ever built.

MEMBER
HYDRAULIC INSTITUTE
U.S.A.

200 lb. per sq. in. to 3000 lb. per sq. in.

PRODUCTS OF
WORTHINGTON

AIR CONDITIONING EQUIPMENT
REFRIGERATION AND ICE PLANT EQUIPMENT
AIR AND GAS COMPRESSORS
STEAM TURBINES
DIESEL ENGINES
GAS ENGINES
CONVERTIBLE GAS-DIESEL ENGINES
CENTRIFUGAL HIGH-PRESSURE BOILER FEED PUMPS
DIRECT-ACTING STEAM PUMPS POWER AND ROTARY PUMPS
DEEP WELL, SUMP, AND DRAINAGE PUMPS
STEAM CONDENSERS AND AUXILIARIES
VACUUM PUMPS
STEAM-JET EJECTORS
PORTABLE COMPRESSORS AND AIR TOOLS
For street, trench, conduit service
V-BELT DRIVES LIQUID METERS

CP9-1

WORTHINGTON PUMP AND MACHINERY CORPORATION

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DENVER DETROIT EL PASO HOUSTON KANSAS CITY

General Offices: HARRISON, NEW JERSEY

Representatives in Principal Cities of Foreign Countries

LOS ANGELES NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH ST. LOUIS ST. PAUL SAN FRANCISCO SEATTLE TULSA WASHINGTON

INDUSTRIAL ENGINEERING

Modern Lighting for a Modern Press

By W. S. MOWRY
Worcester County Electric Company,
Worcester, Mass.

Something more than high quality general lighting was demanded for the pressroom of the Worcester *Telegram and Gazette* with its new Scott straight-line press. General illumination would provide the necessary horizontal foot-candles and high-light the upper travels of paper and the associated balloon folder, but it would not provide the illumination necessary on the vertical sides of the press or carry far enough inside the press. Projectors at ceiling height supplemented by fluorescent lamps inside the press gave the answer to the problem. The extended source and brightness of the fluorescent lamps in this instance have all the advantages and none of the glare and vibration faults of incandescent lamps used on presses.

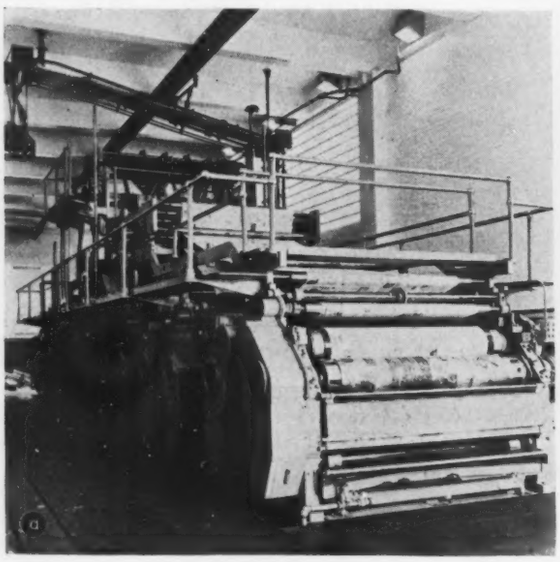
The press is housed in a room 112 ft. long and 25 ft. wide with a height of 22 ft. at the press deck level. With the press 10 ft. wide a 5-ft. aisle was left on one side, allowing a 10-ft. aisle on the plate delivery side. It was stipulated that lighting equipment should not hang down in the room beside the press, be attached to the outside of it, or be in the form of so-called floodlighting located press-high along the walls. A study of press elevation showed that projected light from sources located along the wall at ceiling height would do a fine job of bathing the sides of the press with light. This was more apparent on the wider aisle side, but for symmetry and room illumination the same height was decided on for the lower side, even though a lower mounting height would have been desirable.

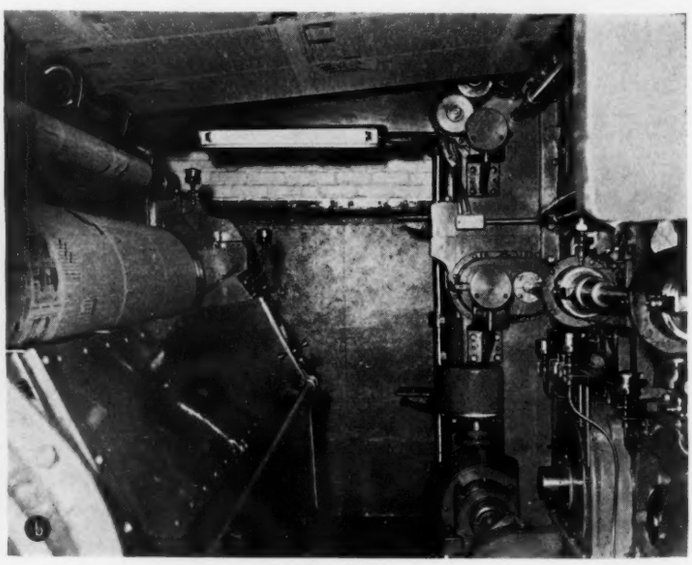
Lighting equipment, furnished by the Litecontrol Corporation, consisted of a large light box with adjustable socket, a high-efficiency mirrored glass reflector and a prismatic lens plate. The assembly was arranged so that the axis of the lens plate carried to the base of the press. In the final installation three different angles from the vertical were used, ranging from 10 to 25 deg. The narrow and wide aisle sides of the press required different angles, as did the rear general area of the pressroom. Fixtures were located in each 8-ft. bay in the ceiling near the wall.

Twelve to 15 ft.-candles of directional illumination was achieved with these units using 300-watt lamps. A 500-watt reflector was used, however, so that intensities could be increased at any location if desired. A total of 24 units were installed, each pair of units serving 200 sq.ft. Considerable beam spread was desired so that

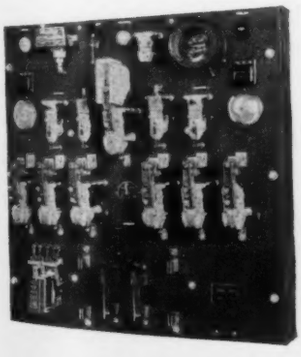
Supplement general illumination on press with fluorescent lamps in press interior

Left—General lighting with 300-watt ceiling units. Right—Aisle lighting inside the press using fluorescent lamps





Good Tools, —but they all need CONTROL



AUTOMATIC ELECTRIC MOTOR CONTROL

Monitor builds standard controllers, starters, and accessories, also custom-built apparatus for any electric motor control problem, no matter how complex. Monitor sales engineers in principal cities will gladly consult with you. Write us.

ONE man swears by steel shafts, another by wood. One man says it's a spoon job. Another calls for a niblick. And all of them are right; these are all good tools, good for the job in hand.

For the thing that really counts, that really puts the ball on the green, is that certain flick of the wrist—*control.*

Monitor doesn't make golf clubs, nor can it give a golfer control. But it does understand the control problems that any electrically-operated equipment presents. If you would like to have your problems surveyed by Monitor Engineers, simply write us. There is no obligation.

• • •

MonitorControllerCompany

Gay, Lombard & Frederick Sts. BALTIMORE, MARYLAND

operators would get light from several different units at once.

Although the overhead system contributes somewhat to the interior lighting of the press, the necessary additional illumination is provided by 24-in., 20-watt daylight type fluorescent lamps in special, small reflectors because of limited mounting space and headroom. One line of lamps runs crosswise of the press at the back of the folder aisle, facing the folder. In other unit aisles lamps at each end of the aisle face each other to throw light toward the center.

Use of the fluorescent lamps eliminates most of the bare lamps found in the average press. The localized lighting (10 ft.-candles inside and 15 ft.-candles outside the press) is inconspicuous and results in perfect visual comfort for the operator moving in and around the press. The connected lighting load in the new press building totals about 21 kw.

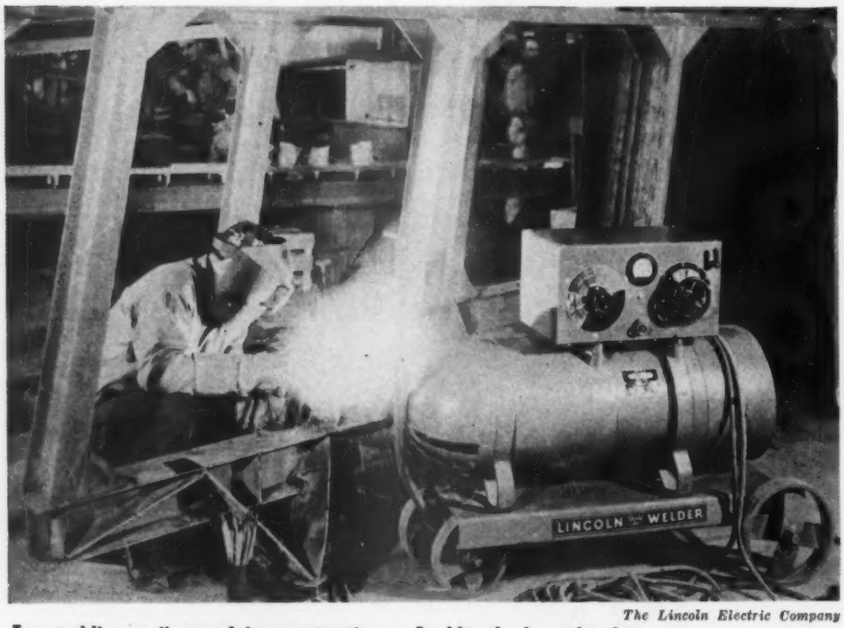
•

Saves $40 Per Plane With Arc Welding

By going to electric arc welding, the Lockheed Aircraft Corporation, Los Angeles, found that it could reduce the fabrication time of an airplane landing gear fork from sixteen hours to eight hours, representing a factory saving of $20 per fork. Two landing gear forks per plane means a $40 saving for each plane.

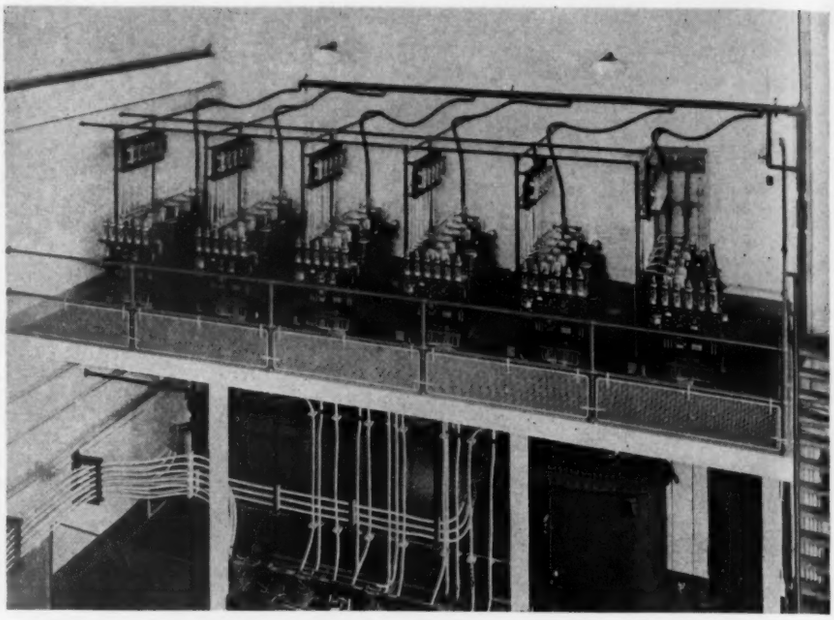
Tests of structural strength obtained by the two methods, according to C. R. deLaubenfels, research engineer of the company, showed that arc welding provides joints 23 per cent stronger than the former method. Tests on specimens of welded tubes (tubes are used in fabricating the landing gear forks) showed tensile strengths of 98,160 lb. per sq.in., as against 79,390 lb. per sq.in. for tubes that were fabricated by the previous method.

The company also uses arc welding for fabricating jigs in which the fuselages are assembled and motor mounts, in addition to the landing gear forks.



The Lincoln Electric Company

Arc welding a jig used in constructing a Lockheed plane fuselage



Six balcony-mounted ignitron rectifiers supply 4,800 amp. at 280 volts to chemical plant

Ignitron Rectifiers Serves Chemical Plant

Six ignitron rectifiers have been supplying the Buffalo Electro-Chemical Company, Buffalo, N. Y., with a total load current of 4,800 amp. almost continuously for more than a year.

Each unit furnishes 800 amp. at 280 volts to a bank of cells for the production of hydrogen peroxide.

Flexibility of operation was the design keynote of the installation. The total load is divided among the six units, so that one or more may be shut down if production schedules call for less than full power output. Each rectifier is provided with individual cathode circuit breakers and anode disconnecting switches, facilitating the removal of a unit from service without disrupting system continuity.

The voltage or load of the battery of rectifiers is controlled by a motor-operated, three-phase shifter, which normally is used to maintain a constant load by means of an automatically operated constant-current regulator. This regulator can be calibrated to maintain any current between 2,000 and 4,800 amp. To conserve floor space, the ignitron apparatus is mounted on a balcony above the transformers.

The units, which were manufactured by Westinghouse Electric & Manufacturing Company, have an arc voltage drop of from 12 to 17 volts.

ROLLER-SMITH ANNOUNCES

New Catalog D-8-a on

METAL CLAD SWITCHGEAR

This Catalog, a copy of which will be sent you on request, should be in the hands of every man interested in metal clad oil circuit breaker switchgear. It is well illustrated and full of technical data and suggestions.

You can't afford to buy metal clad switchgear without consulting Catalog D-8-a.

Roller-Smith makes not only the switchgear but practically all of its components: oil breakers, instruments, primary disconnects, instrument and control switches, transformers, control relays, steel work, etc., etc.

Metal clad switchgear is the *modern* switchgear. Roller-Smith makes all types for all purposes—all up to the minute in design.

ROLLER-SMITH COMPANY

Electrical Measuring and Protective Apparatus

MAIN OFFICE AND WORKS BETHLEHEM, PA., U.S.A.

Sales Agencies in Principal Cities in United States and Canada

LOAD BUILDING

Utility Salesfloor With 100 Ft.-Candles

By H. G. CLUM
Lighting Director,
Jersey Central Power & Light Company,
Asbury Park, N. J.

Illumination intensities in excess of 100-ft. candles mark as unusual the sales floor lighting at the Summit, N.J., offices of the Jersey Central Power & Light Company. Reasons for adopting this type of installation were twofold: (1) To test the effectiveness and practicality of high foot-candle intensity installations and (2) to show by actual example the lighting effects obtainable with available standard lighting equipment, without resorting to special fixture designs.

Six Curtis totally indirect combination mercury-vapor units provide an average intensity of 90–95 ft.-candles through the center of the 34x25-ft. sales floor. These units house a 400-watt high-intensity mercury-vapor unit and five 200-watt incandescent lamps. Direct light from sixteen 300-watt Holophane flush lens units in the 13-ft. 6-in. ceiling is directed toward the side wall to light displays. Beams from these units are cast about 7 ft. off the floor and about 4 ft. out from the wall to yield an intensity of 125 ft.-candles along the side walls. Wattage density on the sales floor is 15.5 watts per sq. ft.

With light surroundings and light colored displays ceiling brightness has not been excessive. Although employees, unused to the high intensity light, found it trying on first acquaintance, they soon became accustomed to it and as a whole like the high intensity for their work. Although at present no facilities are provided for carrying away heat from the lamps during the warm summer months, plans for addition of these facilities are being considered at present. During the winter heat from the lamps is naturally not an objectionable factor.

Lighting intensity of 100 ft.-candles in utility show room proves promotional tool

From a lighting sales promotion viewpoint this installation has met with considerable success. Within two weeks after opening the new showroom an automobile dealer ordered six 1,000-watt indirect fixtures similar to those used in the Summit office, but without the mercury-vapor feature. He was impressed with the need for high intensity lighting and readily accepted the recommendation for higher wattage. During the succeeding six months at least eight other lighting sales totaling about 10 to 20 kw. can be directly attributed to the installation in the show room.

•

Spring Home Shows Pay Sales Dividends

Even though 1938 refrigeration sales for Illinois were off 40 per cent over 1937, Central Illinois Electric & Gas Company reports that sales in the territory in and around Rockford held to within 70 per cent of 1937. The 10 per cent differential between local and state sales percentages is attributed by the company to a program of dealer co-operation and the annual spring "Better Homes Show."

Being a combination gas-electric territory, refrigerators are the major electrical appliance. Sales are entirely through 21 dealers in the territory handling seventeen makes of refrigerators. Central Illinois Electric & Gas Company, co-operating with the dealers, does much of the promotion work in the territory, using newspaper advertising and direct mail. The company also pays half the cost of each dealer's booth at the "Better Homes Show."

The show, which is held annually in May, is sponsored by the real es-

tate dealers to give impetus to the building and house furnishing industries in the Rockford territory. Each year the show features displays of building materials, furniture and appliances. Interest in the show is generally widespread. More than 50,000 visitors attended the 1938 show during a single week.

Prior to the 1938 show a careful customer-by-customer check was made to determine refrigeration saturation in the company's territory. It was found that out of 27,895 meters there were 14,097 refrigerators in service.

Sale of 2,911 refrigerators in 1938 has raised the number of refrigerators on the lines in the Rockford area to roughly 17,000 units, or a saturation of something over 60 per cent.

Of these 2,911 refrigerators it is estimated that about 10 per cent, or 291 units, were placed on the lines as a result of the "Better Home Show," although this estimate cannot be verified. It is estimated that gross revenue from these 291 refrigerators will total around $3,500 a year. In the case of the 1938 Modern Home Show a total of $1,164 was contributed toward the costs of dealer exhibits, representing $4 per refrigerator for the estimated increase resulting from the show.

Breakdown of the 1938 refrigerator sales is as follows:

New refrigerators sold	2,794
Trade-ins	173
Trade-ins sold	117
Trade-ins on hand	19
Trade-ins destroyed	35
Net sales	2,911

•

Commonwealth Edison on Adequate Wiring

By O. R. HOGUE
Manager Lighting and Wiring Sales
Commonwealth Edison Company, Chicago, Ill.

We have been engaged in an extensive and systematic sales campaign using experienced illuminating engineers and lighting salesmen. Our advertising material has covered the wiring story to all of our commercial and industrial customers using direct mail, newspapers and company magazines. During this period 32,500 kw. of lighting, 2,300 kw. of appliances and 2,700 kw. of midget heaters have been sold, and this does not include the kilowatts sold to power and residential customers.

The residential promotional campaign was organized in co-operation with the Electric Association and the Architects Service Bureau. This proved successful as approximately 50 per cent of the new homes built put in 100 per cent standard or better. Customers who install adequate wiring as a general rule use a large number of appliances adaptable for home use and materially improve their lighting requirements. Our figures show that they double or triple the number of kw.-hr. used per month.

During the coming year we anticipate that we shall engage in sales programs supported by commercial, industrial and house wiring salesmen, home service advisers, by lectures, prize contests, advertising, co-operation with the electric associations, residential wiring campaigns and the new EHFA financing plan for residential wiring and refixturing.

•

Outdoor Sales Room With 15 Kw. Lighting

As a result of a careful study of the requirements by the lighting service division of the Indianapolis Power & Light Company the Capital Motors Company of Indianapolis now has an outdoor used-car salesroom illuminated by 8 to 10 ft.-candles with an even coverage of glareless illumination.

On a corner lot, approximately 100 x 200 ft., fifteen Westinghouse type AV16 1,000-watt floodlights, mounted on ten 30-ft. hinged poles, furnish the illumination.

Philadelphia Out for Used Refrigerators

Due to the fact that the saturation of electric refrigerators in the Philadelphia territory has now reached a figure of approximately 56 per cent, the Electrical Association of Philadelphia has adopted a two-part plan.

Part I of the plan consists of a national market index of trade-in values for used refrigerators which is being recommended to all refrigerator dealers.

The index is devoted exclusively to household models and lists the trade-in values of 1,392 refrigerators manufactured by 37 companies and covers models produced during the period from 1928 to 1937 inclusive. The index is a guide for dealers as to the market value of refrigerators which customers may wish to trade in for new models.

Part II of the plan consists of a new company which reconditions all types of refrigerators at a flat price of $20 for all one-door models up to 10 cu.ft. in size provided the refrigerator is in working condition.

As a result, dealers can resell their trade-ins after reconditioning to the lower price market which they are unable to interest in new models. If the dealer does not desire to have a trade-in refrigerator reconditioned for resale, the company will purchase the refrigerator from him at one-half the price listed in the index.

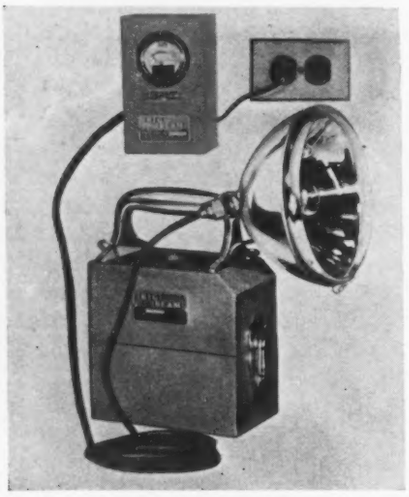
One of the important aspects of this plan will be the junking of all non-salable merchandise.

15 kw. of floodlighting employed by Capital Motors Company of Indianapolis to illuminate this outdoor used-car salesroom. Average intensity is approximately 8 to 10 ft.-candles, provided by fifteen Westinghouse type AV16 1,000-watt floodlights

NEW EQUIPMENT

Rechargeable Hand Lamp

A portable, rechargeable electric hand lamp is offered as an aid to utilities in furnishing illumination on underground, night maintenance or trouble work. The concentrated beam will give working light at 1,000 feet—it will pick out objects 2,500 feet away—with a diffusing lens available for close work or floodlighting. A compact



"Big Beam" portable, rechargeable hand lamp. **U-C Lite Mfg. Co.**, Chicago, Ill.

wet storage battery is housed in the metal container, which is lead coated on the inside and outside as a protection against acid action and is also provided with a rubber reservoir which seals in the vents to prevent corrosion and leakage of the acid. The battery will operate the main bulb for over ten continuous hours and may be recharged by inserting the charging cord plug into the lamp head receptacle, without touching the battery. Any a.c. or d.c. line may be used for recharging or a special dash resistance switch may be used to charge the battery from the service truck engine.

•

Construction Tools

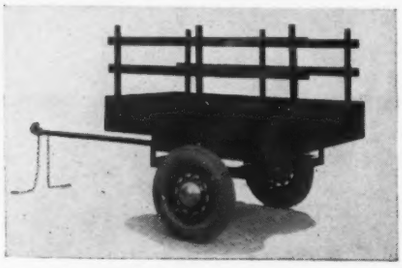
"No. 34" portable electric hammer, **The Black & Decker Mfg. Co.**, Towson, Md.; ⅜ in. "Utility" ball bearing drill, **The Van Dorn Electric Tool Co.**, Towson, Md.

An electric hammer has been redesigned for increase motor power and efficiency to make for faster drilling. A completely self-contained unit, it is powered by a universal motor, mounted at right angles to the barrel and operating through a train of reducing gears. Action of the hammer is developed by an oscillating weight and spring assembly, weight being driven indirectly by a crank. It develops 2,300 blows per min., and has a capacity in concrete or brick of 1⅛ in. The drill is an addition to the company's line, has a no-load speed of 1,100 r.p.m., said to be correct for use with carbon bits; capacity 5/16 in. in steel and ⅝ in. in hardwood.

•

Pole Trailer

A light-weight pole trailer is offered as a practical vehicle for hauling one or two poles used mainly for emergency repair work, as contrasted with larger units for hauling a larger load for line construction work. Chassis may be equipped with a bed as a practical and economical scheme for hauling materials or can be equipped with a slat rack, as shown, making it adaptable for hauling brush, the latter often being something of a problem for line crews which find their regular truck loaded with tools with no room for the brush they may have to dispose of as they go along.



"Rex" pole, brush and general service trailer, equipped with slat rack; ¾-ton capacity; weight, 400 lb. **Rex Mfg. Co.**, Connersville, Ind.

•

Screw Anchor

"PX21" screw anchor; 10-in. diameter. **Malleable Iron Fittings Co.**, Branford, Conn.

New screw anchor is a malleable iron casting, 10 in. in diameter and offered for use with either ⅝- or ¾-in. anchor rod of the desired length. A separate eye nut is screwed onto the anchor rod after installation. A helical blade is used; rated holding power of the anchor is 10,000 lb. under average soil conditions permitting proper installation. The unit has been tested to over 20,000 lb. ultimate tensile strength to failure by breaking the blade away from the hub.

Pole Top Hoist

This light-weight hoist does away with the make-shift hoisting rigs frequently used on pole tops in installing and changing transformers. When not in use, the hoist folds compactly and is easily placed out of the way in the line truck. It will hoist 1,600-lb. transformers without difficulty.

"Quicklift" hoist; weighs 26 lb.; dimensions folded, 36-in. long, 6-in. high, 12½-in. wide. **Line Material Co.**, South Milwaukee, Wis.

•

Machinery Trailer

Carried on 6 wheels, a new heavy-duty machinery trailer has a capacity of 40,000 lb. By removing the front dolly assembly, it may be converted into a semi-trailer. A standard-size kingpin is used which will fit any regular semi-automatic fifth wheel. Other features claimed for this new model include deep, wide-flange main beams, numerous cross members and gusset plates, spring-mounted front dolly, internal expanding brakes.

"DHD-62D" heavy-duty trailer. **The C. R. Jahn Co.**, Chicago, Ill.

How The Kelvinator National Salesman's Institute is

"MADE TO ORDER"

To Help Increase Your Load

Sidney Edlund, President of the Kelvinator National Salesman's Institute, has had a broad experience in sales management and sales training. As founder of the famed "Man Marketing Clinic" he has studied the personal problems of the retail salesman and has made many valuable contributions to the solution of these problems.

SALES TRAINING programs are no new thing with Kelvinator—or with electric utility companies. In fact, the long and friendly relationship between Kelvinator and the industry has been built up on mutual endeavor to better appliance selling—the life-blood of load development.

Fruitful as these efforts have been in the past, Kelvinator has never been content until now—until the announcement of the Kelvinator National Salesman's Institute.

It goes *far beyond* any so-called "sales training" program—not only in the scope of its subject, but also in the *direct, practical, day-by-day method of training*, in the fitting of the salesmen to make the most effective use of Kelvinator promotions and materials.

The Institute is a separate organization, headed by outstanding leaders in sales education. There is constant contact between the Institute and the salesmen, and records made of every lesson. The Diploma is a "Master's Degree" that covers every phase of appliance selling. The men who win it KNOW HOW TO SELL!

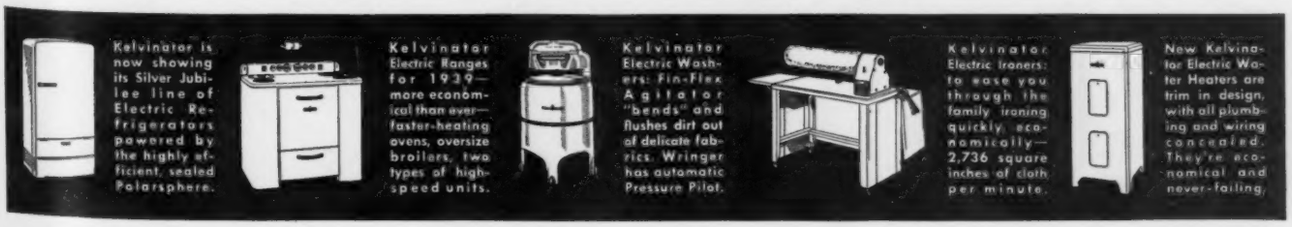
In fact, the Institute is so complete in itself that it demands no supervisory time from busy electric utility sales managers. It is "made-to-order" for the electric utility or any other retail selling organization handling Kelvinator products.

Frank Snyder, able and experienced salesman with Duke Power Company, is chairman of the Advisory Council of the Kelvinator National Salesman's Institute. This Advisory Council, made up of eighteen outstanding salesmen, brings to the Institute practical experiences and varied thinking based on conditions in all parts of the country.

Already, the eager response to the Institute has proved it to be a long-awaited development in your field. Write for the booklet that will give you the entire story. KELVINATOR, Division of Nash-Kelvinator Corporation, Detroit, Michigan.

KELVINATOR

The Oldest Name in Refrigeration


Kelvinator is now showing its Silver Jubilee line of Electric Refrigerators powered by the highly efficient, sealed Polarsphere.
Kelvinator Electric Ranges for 1939—more economical than ever—faster-heating ovens, oversize broilers, two types of high-speed units.
Kelvinator Electric Washers: Fin-Flex Agitator "bends" and flushes dirt out of delicate fabrics. Wringer has automatic Pressure Pilot.
Kelvinator Electric Ironers: to ease you through the family ironing quickly, economically—2,736 square inches of cloth per minute.
New Kelvinator Electric Water Heaters are trim in design, with all plumbing and wiring concealed. They're economical and never-failing.

"MEG"

GROUND TESTER

Ground Testing—
the simple, practical and inexpensive way.

When you invest many dollars in the best grounding equipment available—for protection to human life and property and for service continuity—isn't it worth a few cents more to *know* that you are getting the protection you are paying for?

The "Meg" Ground Tester — one of our "Megger" group of testing instruments — has become an "accepted standard" for ground resistance measurements. For as little as 60¢ per test (according to an investigation by a large user), it is possible to *make sure* of proper grounding of generating stations, substations, transmission towers, transformers, lightning arresters, etc.

Investigate this truly remarkable instrument, which is simple to use, light in weight and *direct indicating*—like a voltmeter.

Ask for descriptive Catalog 1425-W.

JAMES G. BIDDLE CO.
ELECTRICAL INSTRUMENTS
1211-13 ARCH STREET PHILADELPHIA, PA.

Tree Pruner

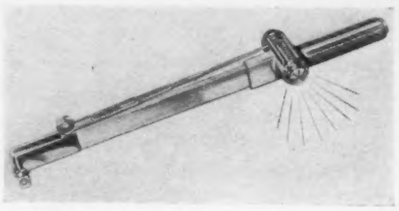
"No. 12" tree pruner; to cut up to 1½-in. branches; available with pole in lengths up to 18 ft. **Seymour Smith & Son, Inc.**, Oakville, Conn.

An improved model of this company's line of tree pruners makes use of double music wire compression springs and features chain and ball bearing pulley operation, a rope being attached to the chain, which works through the pulley. Company's "center cut" principle is retained; cutting blade is supported on both sides, these side pieces also holding the branch being cut on both sides of the cut. In this way a clean cut may be obtained and bark will not be drawn into the cutting parts.

•

Tension Wrench

In tightening studs, nuts or bolts with the ordinary wrench, there is always the danger that too much tension will be applied, with stripped threads or broken metal as the result. With this tension wrench, a light flashes on when the proper, predetermined tension has been reached, telling the user when to stop pulling. The desired tension is pre-set on a "five-in-one" scale, which indicates in.-lb., ft.-lb., spark plugs, and U.S.S. and S.A.E. bolts.

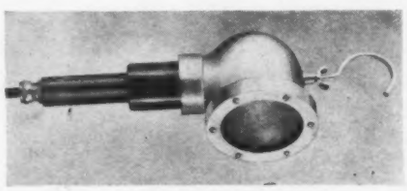


"Torkflash" tension wrench; in two drives: ⅜ in. and ½ in. **Blackhawk Mfg. Co.**, Milwaukee, Wis.

•

Portable Safety Lamp

Where the light is emitted, this explosion- and vapor-proof lamp uses one-quarter-inch duplate safety glass, which, it is claimed, will not shatter if broken nor allow gases or vapors to enter. The hook has a two-inch opening and it is adjustable so that the light may be directed where it is needed and kept out of the user's eyes. Cast aluminum is used for the head and Bakelite for the handle. Since the light is concentrated, only a 50-watt bulb need be used, the company states.



"No. 72" portable explosion- and vapor-proof lamp. **The Ericson Mfg. Co.**, Cleveland, Ohio.

•

Hydraulic Jack

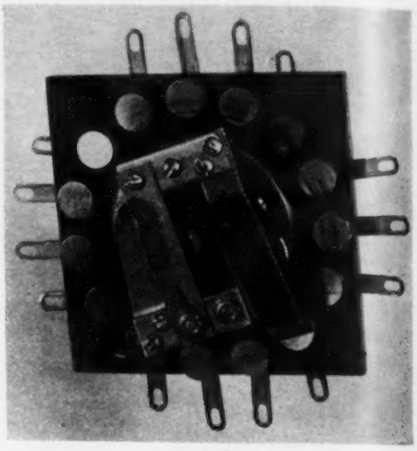
Hydraulic jack; rated capacity, 50 tons; weight, 46 lb.; overall height, 6 in.; lift 2¾ in. **Rochester Machine Co.**, Rochester, Pa.

This light-weight jack has been developed for use in locations too confined to admit a standard-size jack; minimum space required for the lifting cylinder is 5 in. by 6½ in. and maximum length 2 ft. 8 in. A flexible joint connects the lifting cylinder and the two pressure cylinders.

•

Rotary Instrument Switches

Insulated shaft, pierced collector ring, multiple-leaf contact arms are features of this company's rotary instrument switches.



"BN-15" rotary instrument switch, illustrative of line; voltage breakdown between points, 2,500 volts; 10-amp. carrying capacity; other switches built to specifications. **J-B-L Instrument Co.**, P.O. Box 135, Darby, Pa.

Suggested applications include tapping transformers, resistance boxes, attenuators and other circuits where low and constant contact resistance is wanted.

•

Electric Car Spotters

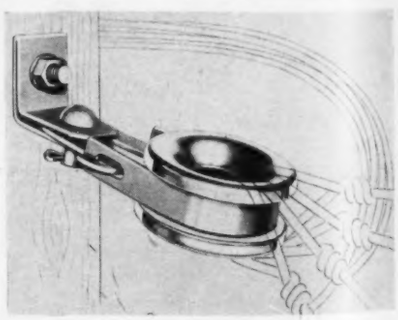
Electric car spotters; No. "5-A" capable of 5,000-lb. rope pull or moving one to three cars, uses 5-hp. motor; No. "10-A", capable of 10,000-lb. rope pull, takes 10-hp. motor. **Link-Belt Co.**, Chicago, Ill.

Vertical-capstan car spotters are offered for spotting railroad cars for loading and unloading and use a high-torque electric motor connected to the spotter drive mechanism by roller-chain coupling, the assembly being mounted on a steel base plate.

•

Take-Off Insulator

Where a number of service drops are connected at various angles to a single pole a new take-off insulator, developed for use with standard rack construction, offers an independent means of dead-ending service conductors. By eliminating overloaded rack spools and tangled connections construction is simplified. When used on



Take-off insulator. **Line Material Co.**, South Milwaukee, Wis.

—"BUT IT'S GOT TO BE EXACT"

—"WELL WE CAN GET EXACT DIMENSIONS IN ILLINOIS PORCELAIN *plus* THE QUALITY WE NEED"

Illinois Porcelain has been the answer for many manufacturers of electrical equipment. You can depend on Illinois manufacturing ability, experience, and facilities to serve your exacting requirements in porcelain insulation from the smallest special bushing to the largest special insulators for electrical equipment.

CENTRAL LOCATION INSURES QUICK DELIVERY anywhere in U.S.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

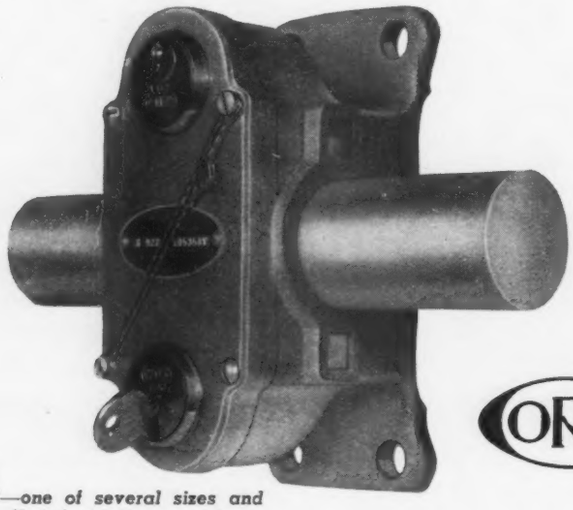
to Standardize on

ILLINOIS

is a Progressive Step

Protectors

OF PERSONNEL AND PROPERTY



Illustrated:
Type B-927—one of several sizes and types for all industrial requirements.

BENDIX-CORY INTERLOCKS

FAR better — far cheaper — than paying insurance compensation! These reliable, key-actuated, self-contained locking units, for both indoor and outdoor use, are universal power-plant equipment.

Bendix-Cory Interlocks and Locking Units have many uses. The commonest are protection against:

(1) OPERATION of disconnecting switches when carrying load; (2) ENTRY to bus cells, oil circuit breaker tank compartments or enclosures for lightening arresters and neutral ground resistors, before switches have been opened; (3) CLOSING of ground and line switches simultaneously; (4) PARALLELING of two separate sources of electrical supply; (5) RE-CLOSING of motor starting switches when making machine repairs and other hazardous operating conditions.

Write for new catalog covering this and other safety equipment!

BENDIX AVIATION CORPORATION MARINE DIVISION

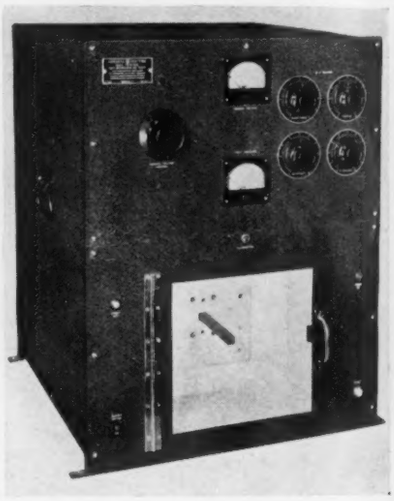
754 LEXINGTON AVENUE **BROOKLYN, NEW YORK**

old constructions it is only necessary to slip the plate clevises of the insulator under the rack spools, snap on the insulator bands and transfer the service conductors to the porcelain rings. On new construction the insulator may be substituted for secondary racks on the pole face opposite the main secondary conductors and on dead-end poles when drops exist ahead of the pole.

•

Coil Tester

A new coil tester for testing the turn-to-turn insulation of a coil, induces in the coil a voltage many times normal to determine incipient flaws or weak-spots in the insulation which, although allowing the equipment in which the coils are used to pass an initial test satisfactorily, might eventually fail and make the equipment inoperative. Output of a standard vacuum-



High-voltage coil tester; for operation from 115-volt, 60-cycle source. **General Electric Co.**, special products section, Schenectady, N. Y.

tube oscillator, supplied by a vacuum-tube rectifier, excites a core of high-frequency material. Detector coils on either side of the exciting winding are connected through a bridge circuit to a vacuum-tube voltmeter which normally reads zero. Coil to be tested is placed over the core and a voltage induced in it; if a breakdown occurs in the insulation, the voltmeter deflects.

•

Snake-Bite Kit

Pocket snake-bite kit. **Davis Emergency Equipment Co.**, New York, N. Y.

Utility companies having linemen in snake-infested regions should be interested in a new pocket snake-bite kit. Kit contains a tourniquet, lancet, blood pump for extracting venom and blood from the wound, antiseptics and bandage compresses.

•

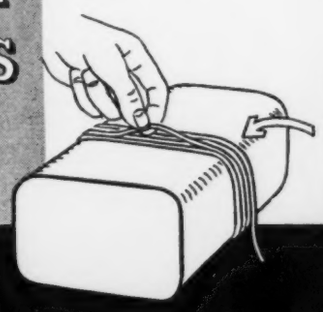
Floor Grating

Steel floor grating. **Walter Bates Co.**, Inc., 208 So. La Salle St., Chicago, Ill.

Electrical pressure welding is used on this new open steel floor grating to force hexagon-shaped cross bars down into and flush with the tops of flat bars, thus forming an essentially one-piece panel, 24 in. maximum width and 30 ft. maximum length. The grating is also offered as stair tread and is intended for use around utility and industrial power plants.

A lesson in coil construction by Pennsylvania

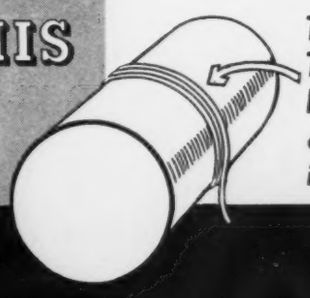
NOT THIS



Tight Only at Corners; Loose on Flat Sides

On a *rectangular* form it is physically impossible to wind a wire tightly, even under maximum tension.

BUT THIS

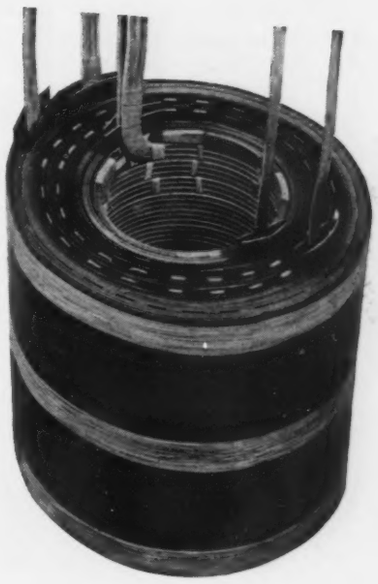


Tension Uniform Throughout Length; No Excessive Stretching Anywhere.

On a *round* form the finest wire can be wound tightly with a *minimum* of tension!

8

A CIRCULAR coil is practically balanced, radially and axially, against short-circuit stresses. When a transformer is subjected to heavy overload or a short circuit, there is no tendency for the coil to move up or down or radially! By eliminating such stresses, the coil is never strained, and insulation never cracks.



● *Pennsylvania uses CIRCULAR coils in ALL its distribution transformers. Many superior advantages justify this costlier construction.*

A DECADE OF PROGRESS IN BUILDING TRANSFORMERS 1929 1939

Pennsylvania TRANSFORMER COMPANY

1701 Island Ave., N. S. Pittsburgh, Pa.

NEWS ABOUT PEOPLE

L. C. Hill Heads Central Power; Kennedy Retires

Lon C. Hill has been elected president of Central Power & Light Co., Corpus Christi, Tex., succeeding James C. Kennedy, who is retiring at his own request. Mr. Kennedy will continue to serve on the board of directors and will be available to the company in an advisory capacity. Mr. Kennedy had been planning to retire for several months. He will maintain his residence in Corpus Christi.

Mr. Hill is well known in South Texas, as well as in financial circles in the North and East. He received his education at the University of Texas and upon completion of his university training in 1911 he engaged in land development in the Lower Rio Grande Valley until 1925, except for the war period when he was in military service. In 1925 Mr. Hill entered the investment banking business with A. C. Allyn & Co., in Chicago, where he spent

L. C. Hill

seven years. Since 1932 he has been in charge of the operations of 3,000 acres of citrus groves at Bayview in Cameron County, as well as managing Port Isabel properties. At the same time

J. C. Kennedy

he has been associated in the investment banking business with A. S. Huyck & Co. of Chicago.

Mr. Kennedy, the retiring president, has been engaged in the engineering and utility fields since completing his college training. Early in his career Mr. Kennedy engaged in engineering work in the Rio Grande Valley and later became manager of the utility properties of the Brenham Compress, Oil & Manufacturing Co., the position he held until 1918. After war service, Mr. Kennedy assembled a large group of utility properties in east Texas for what is now known as the Southwestern Gas & Electric Co., and served as president of that company. It was Mr. Kennedy who negotiated the purchase of C. P. and L. properties for the present owners in 1925 and was made president of C. P. and L. A promotion took him to Dallas as president of American Public Service Co. and the Central and Southwest Utilities Co., which was at the time a supervising organization for C. P. and L., as well as other large utility companies in Texas, Louisiana, Oklahoma and Arkansas. Mr. Kennedy went to Corpus Christi to serve as president of C. P. and L. in 1932.

E. E. Kime of West Coast Power Company Promoted

Elmer E. Kime has been appointed operating manager of the West Coast Power Co., Portland, Ore., in charge of all properties in the western part of that company's territory from Reedsport, Ore., to Shelton, Wash. This appointment will relieve W. C. MacInnes, president of the company, from operating routine, and permit him to spend his entire time as executive head of the three operation companies, the West Coast Power, California Public Service and Western States Utilities.

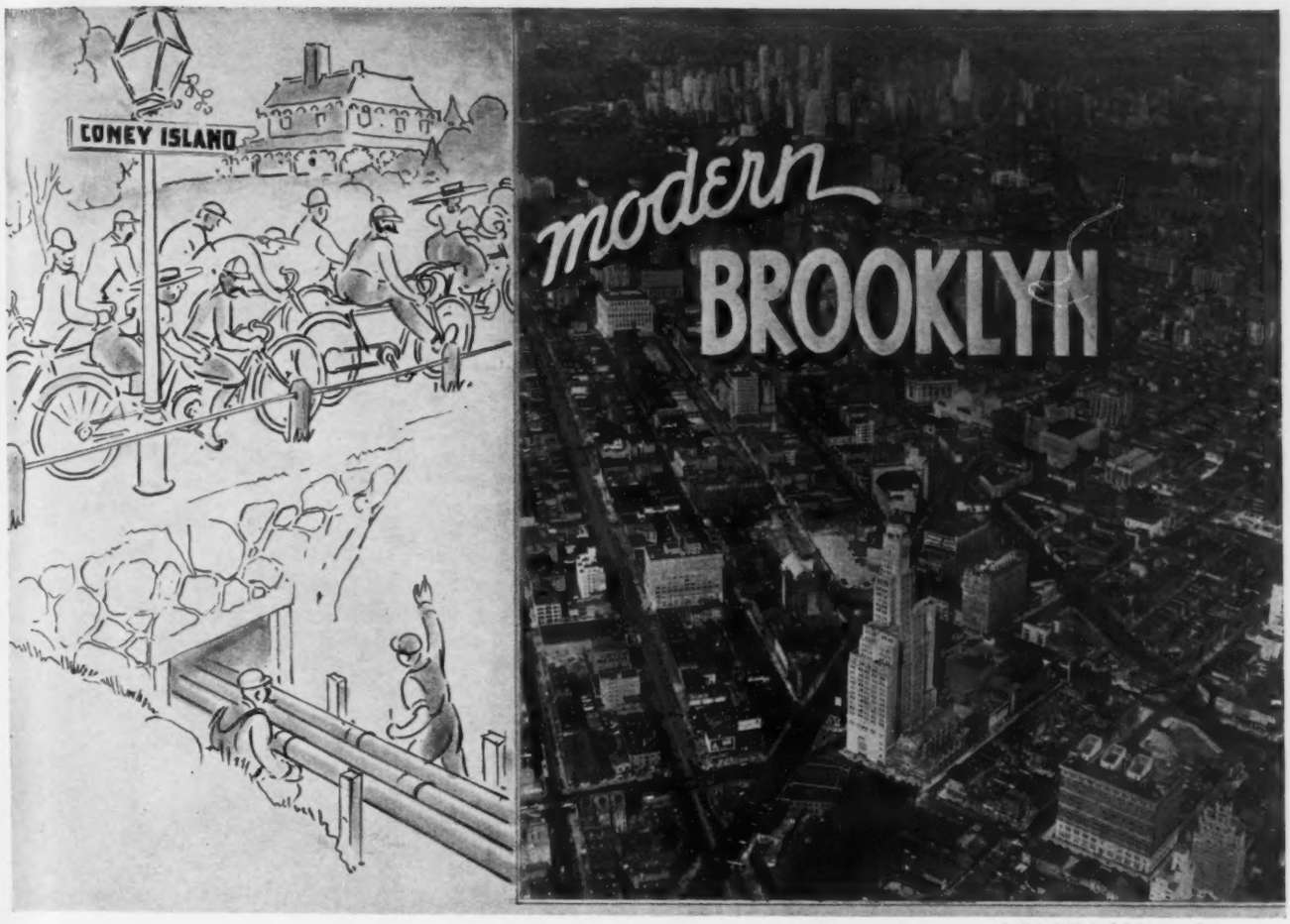
Mr. Kime has been identified with the utility business since 1916, when he was in charge of the electric operations of the Nevada Consolidated Copper Co. He served subsequently with the Arizona Power Co., in charge of steam

and hydro operations, and with the Needles Gas & Electric Co., Needles, Calif., as manager. In 1932 he joined West Coast Power and since has served as division manager in both eastern and western properties.

•

► JUSTIN W. LESTER retired recently as comptroller of the Boston Edison Co. to be succeeded by Edward J. Hyland,

ORANGEBURG HAS *long* BEEN PART OF



© Fairchild Aerial Surveys, Inc.

Brooklyn enjoys a fine pattern of industrial, commercial and residential balance—all three, important phases of utility service—demanding a high degree of service continuity—hence Brooklyn's continuing program of underground networks—the most modern in character.

WATERTIGHT INSTALLATIONS

Even the most corrosive ground waters cannot penetrate or affect Orangeburg.

The Harrington (taper sleeve) Joint is precision machined and watertight with ordinary field assembly practice. The use of Jointing compound or wrapping is neither necessary nor recommended.

One of the many Orangeburg "points that count."

Orangeburg, trademark, is a guarantee of the best of Fibre Conduits, a time-tested enduring "service" of cable protection *wherever electrical raceway facilities are to be installed underground.*

● First made in 1893, Orangeburg Fibre Conduit has been in active service underground, in all parts of the country, for decades. Miles of Orangeburg, installed at the "turn of the century" are in active service today.

The improved Orangeburg of recent years justifies an expectancy of even longer trouble-free conduit facilities and, most important, permanent cable protection.

Orangeburg *Standard* Fibre Conduit, for installation underground *with* concrete encasement is recommended for duct banks (4 ducts and over), main distribution, high tension and "downtown" locations.

Orangeburg NOCRETE, the new dual economy conduit for installation *without* concrete encasement, is recommended for service entrances, extensions, parkways and street lighting, suburban distribution, laterals, signal systems, etc.

Sales Agent—Distributors

GRAYBAR ELECTRIC COMPANY INC.

GENERAL ELECTRIC SUPPLY CORP.

MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE., NEW YORK CITY

ORANGEBURG

Standard for installation *with* concrete encasement
Nocrete for installation *without* concrete encasement

THEY ARE BETTER BECAUSE they are more efficient than old methods of clamping, bolting and soft soldering.

In a Sil-Fos brazed system the joints do *not* set up extra resistance in the circuit. Their conductivity is as high or higher than the copper bus itself.

In effect, joints are the same as solid metal and like solid metal, they retain their original electrical properties. Oxidation in the joint is no longer a problem—there's no need for tightening, cleaning or servicing.

Investigate this modern bus bar joining method. Find out how it saves copper and reduces installation costs. Write us for Bulletin 54-EW and our Bus Bar Reprint.

HANDY AND HARMAN
82 Fulton St.
New York, N. Y.
Agents in Principal Cities
HANDY & HARMAN of Canada, Ltd., Toronto

formerly, assistant treasurer. The latter position is being filled by Arthur J. Havlin. Mr. Lester is widely known in the utility field, having entered the Boston company's service in 1923 as superintendent of accounting statistics, following a term of service with the Massachusetts Department of Public Utilities, where he was chief of the accounting division. He was engaged in railroad, industrial and banking activities during his earlier career, both in the West and in New England.

▶ HOPEWELL ROGERS has been elected chairman of the board of the Belden Manufacturing Co., Chicago, and Whipple Jacobs, president. Herbert Pope of Pope and Ballard and C. S. Craigmile, vice-president of the company, have been elected directors.

▶ C. R. DONOVAN, formerly representing the National Electrical Manufacturers Association business development activities to mutually interested national associations and federal agencies, has resigned to enter the recently organized Owens-Corning Fiberglas Corp., where he will assist in developing applications and broadening acceptance of fiberglas.

▶ FREDERICK W. JESSER, secretary of Consolidated Edison Co. of New York, completed fifty years of service on March 31. He has the longest service record of any man now in active employment on the electric side of Consolidated Edison's business. In celebration of this occasion Mr. Jesser was the guest of honor at a luncheon given by 24 business associates at the Terrace Club at the World's Fair. Oscar H. Fogg, vice-chairman of Consolidated Edison Co. presented a fifty-year button to Mr. Jesser.

▶ J. F. MCINTIRE of Detroit, vice-president of the United States Radiator Corp., was elected president of the American Society of Heating and Ventilating Engineers at the recent annual meeting. Mr. McIntire has been active in the society for more than ten years.

▶ WALTER N. FORD, vice-president and assistant general manager of the Memphis Power & Light Co., Memphis, Tenn., since 1925, has become manager of industrial development for the United Gas & Pipe Line Co. He assumes his new duties at Houston, Tex., April 15. A native of Kentucky, Mr. Ford joined the Memphis Street Railway Co. in 1910 and remained with that organization until 1923. He then became purchasing agent and superintendent of stores for the Memphis Power & Light Co., two years later assuming the duties of vice-president and assistant general manager.

Smith Made Vice-President of National Power & Light

Raymond H. Smith has been elected vice-president of National Power & Light Co. and of its subsidiary, Lehigh Power Securities Corp., effective April 1. Mr. Smith, who succeeds the late E. B. Lee, has also been elected a director of both companies.

Mr. Smith has had almost 40 years experience in the public utility field starting in 1896 with the Waterbury (Conn.) Traction Co. From 1900 to 1907 he was with the Connecticut Power & Light Co. as purchasing agent, assistant to the general manager and superintendent of the company. Later

he served as vice-president and general manager of the Albany (N. Y.) Southern Railway Co., then as general manager of the Jackson (Miss.) Power & Light Co., and as vice-president and general manager of the Eastern Wisconsin Electric Co., with properties at Oshkosh, Fond du Lac and Sheboygan, Wis.

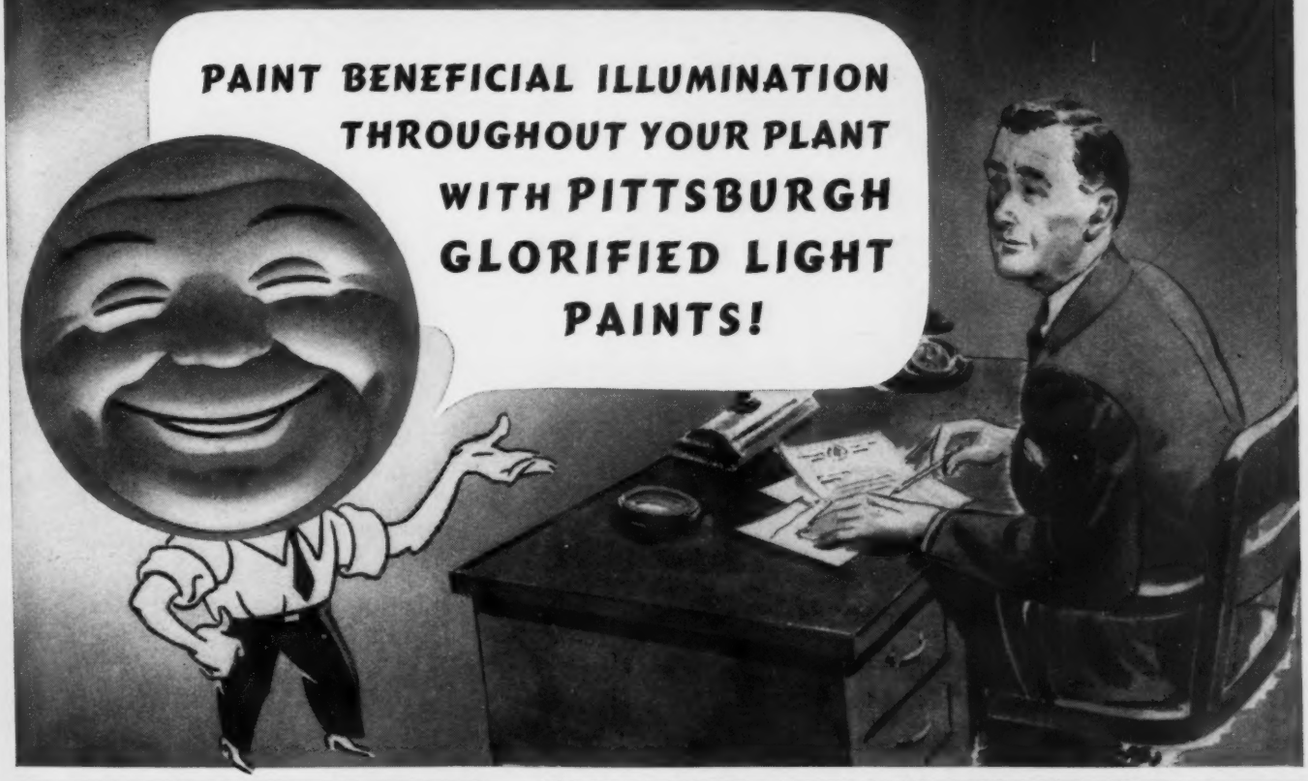
Mr. Smith joined Electric Bond & Share Co. staff in 1919 and has been with the organization since that time. Since 1935 he has been with Ebasco Services Incorporated, service subsidiary of Electric Bond & Share Co., as operating sponsor for client companies in Alabama and Tennessee.

OBITUARY

R. B. Childs

R. B. Childs, assistant general manager of the Washington Water Power Co., Spokane, died in his sleep on March 31 in Victorville, Calif. Although Mr. Childs had been in poor health since the beginning of the year, he was reported as recoving and early last

Increase Production—Reduce Accidents —Make Employees Happier!



YOU MEAN TO SAY PAINTING CAN HELP MY LIGHTING?
YOU BET IT CAN. PITTSBURGH GLORIFIED LIGHT SYSTEMS REFLECT AND DIFFUSE AVAILABLE LIGHT MAKING BETTER ILLUMINATION POSSIBLE

LATER

I'VE GOT TO HAND IT TO YOU, "SUNNY," CONDITIONS HAVE CERTAINLY IMPROVED SINCE WE PAINTED THE PLANT WITH GLORIFIED LIGHT PAINTS

DON'T let improper lighting cut into production and profits. Paint helpful, healthful illumination into *your* plant with Pittsburgh's Glorified Light Systems. These light-distributing finishes are custom-made to fit any type of factory condition. They reflect and diffuse available light—natural and artificial—making every foot candle do full duty. Your employees see better, work more efficiently. Production is increased and accidents cut down. Get the complete facts—how to bring *glorified light* into your plant. Just clip the coupon below. Pittsburgh Plate Glass Company, Paint Division, Pittsburgh, Pennsylvania.

THERE IS A GLORIFIED LIGHT PRODUCT FOR EVERY TYPE OF PLANT!

THE SNOLITE SYSTEM will bring profitable Glorified Light into any plant with normal interior surfaces.

THE SNOTEX SYSTEM is specially designed for all abnormal interior surfaces except those affected by fungus growth. It resists discoloration from humidity, fumes, gases and lack of daylight.

THE FUNGUSIDE SYSTEM effectually retards the growth of fungus. It is vitally necessary in bakeries and food plants —wherever fungus presents a serious problem.

Copr. 1939 Pittsburgh Plate Glass Co.

PITTSBURGH PAINTS

Smooth as Glass

COMPLETE LINE OF STRUCTURAL MAINTENANCE FINISHES

Pittsburgh Plate Glass Company
Paint Division, Dept. EW4,
Pittsburgh, Pennsylvania

Please send me free your book, "Glorified Light".

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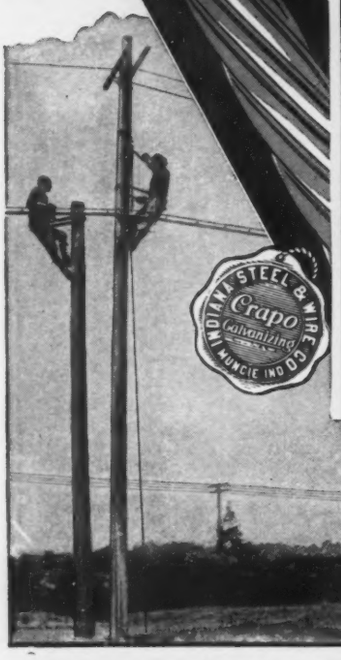
STEEL STRAND ✣ TELEPHONE WIRE

Crapo

GALVANIZED PRODUCTS



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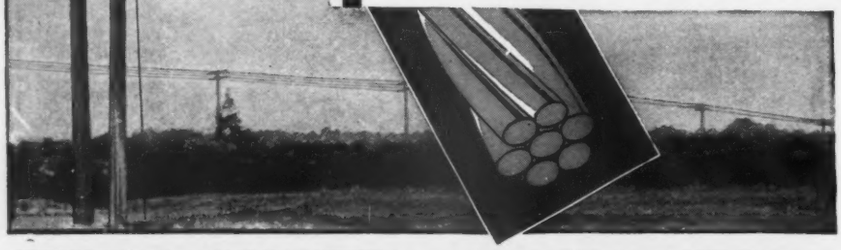
Crapo Galvanized Steel Strand is a highly specialized product scientifically manufactured under direct laboratory supervision. Each grade and size is produced from start to finish to meet the exacting demands of the service for which it is intended. Each wire used in forming a particular size and grade is made from the same special steel, processed in the same way, and galvanized by the *Crapo* Process.

For further information consult the nearest distributor of *Crapo* Galvanized Products, or write direct!

INDIANA STEEL & WIRE CO.
Muncie, - - Indiana



GREENLEE TOOLS

Hydraulic Conduit Benders
Hydraulic Pipe Pushers
Copper Tube Benders
Cable Pullers
Knockout Punches
Knockout Cutters
Radio Chassis Punches
Spiral Screw Drivers
Push Drills
Joist Borers
Electricians' Bits
Bit Extensions

Ask for This New Catalog

Everyone interested in bending conduit or pipe, installing pipe underground, pulling cable into conduit, or doing any operation suggested by the list of tools shown here, should have a copy of our new Catalog No. 31-E. If also interested in our line of hand tools for working wood—auger bits, car bits, ship augers, chisels, gouges, draw knives, etc.—ask for Catalog No. 31. It includes all such tools in addition to those in Catalog No. 31-E.

GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

month left the University of California hospital in San Francisco.

Mr. Childs first became associated with Washington Water Power in 1923, when the local electric service company took over the Intermountain Power Co. He then was Seattle representative for the Intermountain company. In 1930 he was named assistant general manager of the Washington Water Power Co. and later in that year he assumed the duties of assistant general manager for the Spokane Central Heating Co. and Spokane United Railways. At the time of his death he held these positions, in addition to directing the Spokane division activities of Washington Water Power.

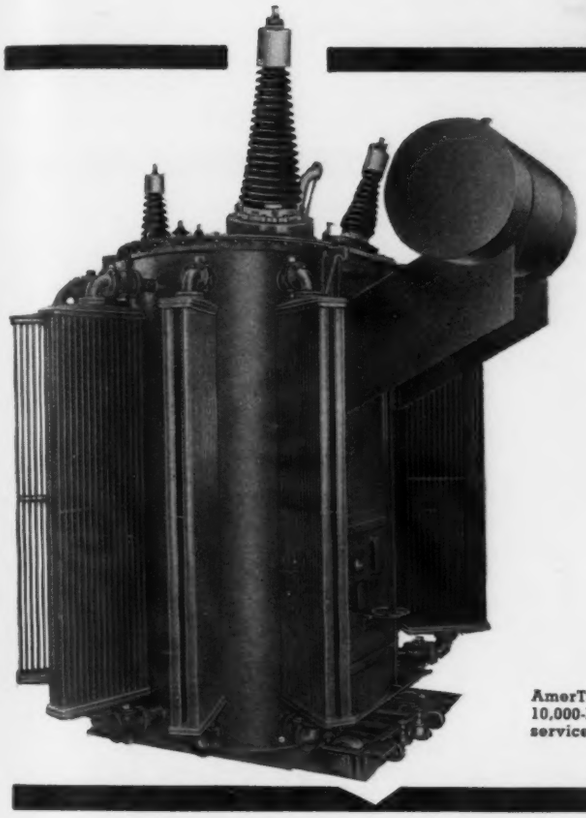
In commenting on the death of Mr. Childs, J. E. E. Royer, vice-president and general manager of the Washington Water Power Co., said: "The news of Mr. Childs' death comes as a terrible shock. The entire Water Power family will feel his loss not only as a friend loved by his many associates but as well for his able guidance in the business affairs of the company."

•

▶ CHARLES STILLWELL, an associate of Thomas A. Edison in the founding of his business enterprises and brother of the inventor's first wife, died March 29 at his home at Avon, Conn., after a long illness. He was 78 years old. He had been blind since 1903, when his eyesight failed as the result of an injury received twelve years before while experimenting with an incandescent lamp. After serving an apprenticeship with the inventor in the development of the electric light, Mr. Stillwell was sent to Canada as the first general manager of the Edison company there. The accident which cost him his sight occurred during an experiment in the Hamilton, Ont., plant of the company.

▶ CLYDE I. COTTOM, general superintendent of lines, West Penn Power Co., died March 27 at his home in Pittsburgh, Pa., in his fifty-eighth year. His first connection with a public utility company was as a lineman and engineer with the United Light Co. at Uniontown, Pa. When that company was merged with West Penn Power Co., Mr. Cottom was transferred to Manor, Pa., as a substation operator. Subsequently he was connected with the Jeannette, Connellsville and Dawson districts. In 1912 he was made assistant to superintendent of the commercial department; in 1918 he was placed in charge of the work order department and was promoted to distribution engineer in 1919, the position he held for three years when he was appointed superintendent of transmission lines. In 1930 Mr. Cottom was promoted to general superintendent of lines.

FEATURES



AmerTran Type CC, single-phase, 10,000-Kva. power transformer for service on a 125-Kv. line.

Designed for convenience

When designing an AmerTran Power Transformer our engineers give full consideration to problems which will confront the user throughout the entire life of the equipment. Features are incorporated which will insure maximum convenience and economy from all viewpoints . . . installation, operation, maintenance and repair. Further, all units are designed to be self protecting against damage from lightning surges and momentary short circuit, and to give long, dependable service in continuous operation under full load. Look for the features below; they are your guarantee of maximum value. Let us submit data on transformers for your needs.

AMER TRAN

AmerTran transformers offer all this, and more too

Every unit is constructed so as to enable either complete dismantling or reassembling with a set of wrenches—no special tools are required.

Cores are cruciform in cross-section, rigidly bolted and well reenforced for maximum mechanical strength.

Coils are of fully balanced design, have high turn-to-turn insulation and are varnish impregnated by the vacuum-pressure process; they are ruggedly constructed and rigidly supported to withstand severe stresses.

Connections throughout are electrically brazed.

Interiors of tanks are protected by an oil-proof paint which is incapable of causing oil sludging.

Tanks are fabricated from heavy steel plate, have only one vertical seam and are capable of withstanding a 28-inch commercial vacuum; they are tested under both pressure and vacuum.

Exteriors of tanks are thoroughly cleaned by sand blasting and protected by three coats of weatherproof paint.

Wheels are hand forged and equipped with roller bearings.

Tap-changer operating handles are located close to floor level and adjacent to instruction plate.

Radiators are equipped with positive, marine-type cocks, oil-drain valves and air vents, so as to enable repair with operation of transformer maintained.

External parts are rust resistant.

Auxiliaries and fittings, such as bushings, radiators, valves and gauges, are standard component parts; replacements are generally available.

Gaskets used throughout are pre-compressed.

Impulse voltage distribution is such that full advantage is taken of all insulation without overstress at any point. Needless shielding, which adds extra parts that might cause future trouble, is avoided by careful design.

Balance of exciting and load losses is such that maximum economy of operation is provided for the operating condition.

Noise-level, impulse and other commercial acceptance tests are furnished, if required.

AMERTRAN

AMERICAN TRANSFORMER COMPANY

178 Emmet St., Newark, N. J.

Manufactured
Since 1901
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TRANSFORMERS

MANUFACTURING - MARKETS

Refrigerator Sales Show Sharp Advance

Domestic sales of electric household refrigerators in February totaled 184,643 units, compared with 140,053 units in January, according to a report issued by the National Electrical Manufacturers Association. This total compares with 134,946 units in February, 1938. For the two months ended February domestic sales totaled 324,695 units, compared with 232,587 units for the similar period of 1938.

World sales in February amounted to 197,781 units, compared with 147,623 units in January and 148,726 units in February, 1938. Canadian sales advanced sharply, totaling 4,545 units, compared with 2,578 units in February, 1938. For the two months ended February world sales totaled 345,404 units, as compared with 255,588 units in the similar period of 1938.

•

Manufacturers' Sales Gain 6% Over Year Ago

Manufacturers' sales of electrical machinery, apparatus and supplies during February, as reported by 101 firms, totaled $21,642,000, a decrease of 5.4 per cent from January, but a gain of 6.0 per cent over February a year ago, according to the Department of Commerce.

For all industries reporting, totaling 1,679 firms, manufacturers' sales for February were $277,920,000, a decrease of 1.7 per cent from January and a gain of 9.0 per cent over February last year.

•

Newton Falls Contracts for Electric Plant Let

Contracts for the $175,000 municipal light and power plant at Newton Falls, Ohio, have been awarded by council and the board of public affairs, with the WPA to pay 45 per cent of the costs. An injunction suit, meanwhile, was filed by the Ohio Public Service Co., which sought to halt the opening of the bids on the ground that the legislation under which they were received was passed as an emergency.

The awards include contracts for generating equipment to Fairbanks, Morse & Co., Chicago, $56,282; switchboard, Laganke Electric Co., Cleveland, $10,700; distribution system, O'Rourke Electric Service, Mt. Vernon, Ohio, $68,542.

•

Earnings Reports for 1938 Issued

Among the earnings statements issued covering 1938 operations are the following:

ANACONDA WIRE & CABLE—Net loss, $97,781, in contrast with a net income in 1937 of $1,985,242, or $4.70 each on the 421,981 capital shares outstanding. Balance sheet on December 31 shows current assets of $10,364,790 and current liabilities of $2,619,233, compared with $12,153,127 and $4,642,322, respectively, on Dec. 31, 1937.

CARRIER CORP.—Including subsidiaries, net loss, $1,133,021, contrasted with net profit in 1937 of $250,794, equal to 64 cents each on 390,808 shares of no-par capital stock. Current assets as of December 31, 1938, including $1,430,031 cash, amounted to $4,385,432, and current liabilities were $1,161,260, comparing with cash of $556,171, current assets of $4,399,290 and current liabilities, including $1,000,000 notes payable, of $2,293,272 at end of preceding year. Inventories were $2,151,785, against $2,504,040.

HOLOPHANE CO.—Reports for six months ended December 31, net profit of $68,936 after charges and federal income taxes, equivalent after dividend requirements on $2.10 preferred stock, to 55 cents a share on 98,444 no-par shares of common stock. This compares with $151,715 or $1.38 a share on common for the six months ended December 31, 1937.

HYGRADE SYLVANIA—Net income, after all charges and taxes, $438,691, equal after preferred dividends to $1.48 a share on the 204,684 shares of common stock outstanding. Current assets December 31, 1938, were 6.0 times current liabilities.

Electrical Exports Show 1.6% Increase

Exports of electrical equipment during February were valued at $7,390,087, a gain of 1.6 per cent over January, when sales abroad totaled $7,275,711, but a decrease of 13.1 per cent from February a year ago, when they were valued at $8,504,206, according to the Electrical Division of the Department of Commerce.

Included in the total were "distribution transformers 500-kva. and less", foreign sales of which totaled 575 units valued at $58,588 in February as against 166 units valued at $35,650 in January. Exports of "power switches and circuit breakers over 10 amp." rose to $212,874 in February as compared with $118,191 in January. Large-sized stationary motors also showed a substantial gain, those ranging from 1 to 200 hp. increasing to $98,301 from $71,579, while those over 200 hp. increased to $113,139 from $31,469.

•

Gets Elevator Contract

Westinghouse Electric Elevator Co. has received a contract for ten elevators and an electric stairway for the new combination garage and office building now going up in Rockefeller Center, New York City.

•

Carrier Names Directors; Predicts Business Rise

Stockholders of the Carrier Corp. at their recent meeting in Wilmington, Del., elected three new directors. The new members are Clifford Hemphill of Hemphill, Noyes & Co.; E. C. Wampler of Stern, Wampler & Co., Chicago and Bayard E. Pope, chairman of the Marine Midland Corp., and treasurer of the New York World's Fair.

In predicting at least a 25 per cent increase in the air conditioning business in 1939 over 1938, J. I. Lyle,

MEEK AS MOSES
~ *usually*

"Good old mule" or "Dang that ornery critter!"—it all depends on how he's behaving. The electric power that runs your machines has some of his good characteristics—one-track, hard-working, powerful—but also shares a fault. When it slips its harness and goes on a rampage—look out! The task of keeping electricity dependably at work is sometimes a problem, particularly in vital spots of power plant, equipment or product, where conditions of heat, moisture, friction and other unusual circumstances make ordinary insulating materials ineffectual. One material—Macallen Mica—stubbornly resistant to all those combined conditions—solves that problem precisely and enduringly. Specify mica and we will produce the type and shape to do the job.

THE MACALLEN COMPANY

16 MACALLEN STREET • BOSTON • MASSACHUSETTS

CHICAGO: 585 W. Washington Blvd. CLEVELAND: 1105 Leader Bldg.

COMPRESSED SHEET • MICA PAPER, CLOTH TAPE • HEATER PLATE • COMPRESSED SHEET TUBING • COMMUTATOR INSULATION • COMPRESSED SHEET WASHERS • INSULATING JOINTS AND CANOPY INSULATORS • RAILWAY SPECIALTIES • DOMESTIC AND IMPORTED RAW MICA.

MACALLEN MICA

ROME-CABLE
ROME, N.Y.

Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
(In Rounds, Flats and Squares)
URC Weatherproof Wire
Cotton, Paper and Asbestos Magnet Wire
(In Rounds, Flats and Squares)
Rubber Insulated Wires and Cords
Lead Covered Cables • Multiconductor Power Cables
Network, Service Entrance, Control Cables

ROME-60
ROME CABLE CORP. ROME, N.Y.
That New, Tough, 60% Jacketed, Heavy Duty Portable Cable

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Boston Richmond Philadelphia Los Angeles

Specify the BURNDY SERVIT

"FOR THE LINE OF *Least* RESISTANCE..."

BURNDY ENGINEERING CO. INC. · 459 E. 133 ST., N.Y.C.

president, said that the company is "well equipped to take advantage of this improvement in business."

•

Norge Reports Sharp Rise in Shipments for March

Shipment of Norge refrigerators, ranges and washers approximated 36,000 units, against 29,500 a year ago, preliminary month-end reports of this division of Borg-Warner Corp. indicate. April production is being stepped up 25 per cent with shipment of 45,000 units scheduled. Open orders at the end of March were about 50,000, against 31,500 a year ago.

Howard E. Blood, vice-president of Borg-Warner and president of the Norge division, stated that March shipments, of better than $4,500,000, were the heaviest of the year to date and "every indication points to increasing volume through the second quarter."

•

Moves Philadelphia Office

Ward Leonard Electric Co., Mount Vernon, N. Y., has announced a change in address of its Philadelphia office. The new office is located at 1600 Arch Street. Frank Beede, formerly of the Chicago office and for several years attached to the sales engineering department at the factory, Mt. Vernon, N. Y., is district manager.

•

Canadian Westinghouse

Canadian Westinghouse Co., Ltd., reports net profit of $1,323,483 for 1938, equal to $2.42 a common share, as against $1,331,758, or $2.43, in 1937. Net working capital was $9,975,839, against $10,702,968; cash was $1,480,506 and government bonds and other securities totaled $4,341,414. Inventories decreased $1,817,975 to $5,624,238.

•

Blast Furnace Air Unit

Contract for what is claimed to be the first air conditioning in the country of a blast furnace has been let by the Woodward Iron Co. of Birmingham to the Carrier Corp. The object is to control the moisture in the air and thus obtain greater uniformity in the pig iron output.

New York Metal Prices

	Apr. 4, 1939 Cents per Pound	Mar. 29, 1939 Cents per Pound
Copper electrolytic	10.75*	11.25*
Lead Am. S. & R. price	4.85	4.85
Antimony	11.50	11.25
Nickel ingot	35.00	35.00
Zinc spots	4.89	4.89
Tin straits	46.50	46.50
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

Field Reports on Business

European war scares and failure of the Administration tangibly to aid business are given as reasons for the unsettled conditions in the security markets and the failure of any sharp expansion in industrial activity. Some hesitancy has been displayed in the placing of forward orders.

NEW YORK

European war scares caused a sharp break in the security markets last week and the unsettlement has been in evidence this week. While many feel that the domestic situation will improve and that industrial activity is on the upturn, yet there is evidence that some hedging is in progress. Orders have slowed up a bit and inventories have been allowed to reach low levels.

The Delaware Electric Power Co. of Wilmington has ordered 55 trolley coaches to be built by J. G. Brill Co. and the Mack Manufacturing Co., of which 49 will be equipped with General Electric motors. The order, said to be the largest single purchase of trolley coaches, involves about $750,000. Duluth Superior Transit Co. (Minn.) has ordered ten 40-passenger trolley coaches to be equipped with General Electric motors.

At the Carrier Corp. exhibit here last week company officials predicted sales would top those of 1938 by a good margin. Lower prices and offering of more "packaged" units is expected to aid air-conditioning sales.

Kelvinator division of Nash-Kelvinator Corp. has launched its spring selling drive with nation-wide birthday parties celebrating its 25th anniversary.

While news from Washington is anything but encouraging to business, many industrialists feel that Congress will soon show its independence by doing those things which will allow business to expand.

NEW ENGLAND

Distribution line materials are active in this district and buying, according to one manufacturer, is more marked now than is usual at this season. Distribution transformers and watt-hour meters are selling well. Purchases of supplies are in the offing for a new 7-mile, 15-kv. line extending from Beechers Falls to Pittsburg, N. H., to be built by the Public Service Co. of New Hampshire; this company also plans to build a 6-mile, 115-kv. line during the coming season and has completed a 33-kv. duplicate circuit between Merrimack and Milford on its system.

Industrial equipment orders are steady and confined in large part to machine and tool manufacturers who are pressing for quick deliveries on motor capacities up to 5 hp. Small switch and control apparatus orders are being received in good volume.

Inquiries for special electrical apparatus covering widely diversified purposes are gaining. The demand for reflectors for fluorescent lamps is very active; one manufacturer is sold out for several months ahead. Two Hartford, Conn., industrial plants have each bought a 35-kw. Leeds & Northrup "Homocarb" electric furnace.

The B. F. Sturtevant Co., Hyde Park, Mass., has announced the receipt of an order for evaporators and fans for General Electric railway car air-conditioning equipment to be used on ten new dining cars and 20 renovated coaches of the Pennsylvania Railroad. The Amesbury Electric Light Company has established new offices, sales, demonstration and stockroom facilities occupying 18,000 sq.ft. in the center of the town. About $10,000 worth of operating equipment was demonstrated to hotel and restaurant owners in a recent successful three-day commercial electric cooking school at Hartford.

PACIFIC COAST

The Friant Dam unit of California Central Valley Project, to be begun by June 1, will materially improve industrial business through its requisite 320,000 tons of cement, 10,000,000 ft. of lumber, 15,000 tons of steel and 28,000 tons of fuel and lubricants.

Westinghouse was low bidder at $1,454,700 for two 82,500-kva. generators for Boulder plant. The Bonneville plant is buying much varied machinery for its transmission and distribution systems, including a $19,710 low bid by Porcelain Products for 115-kv. guying material, low bids totaling $284,000 for materials and erection of Columbia and Willamette Rivers crossings; 115-kv. hardware and conductor and ground wires for the Kelso, Raymond and The Dalles extensions; a $25,000 low bid by Pacific Electric Manufacturing Co. for 115- and 196-kva. disconnect switches for Raymond substation and a low bid of $44,031 from American Transformer Co. for three 4,000-kva. transformers for Raymond.

Pacific Gas & Electric Co. is constructing a $15,000 line to serve 51 families northwest of the mining community of Grass Valley, Calif., and reports excellent load increases from mines scattered all through the Sierra foothill belt.

CHICAGO

Conservative gains were recorded over the previous week in most lines of business as the first quarter drew to a close. Utility construction expanded substantially in the Middle West during the last month and residential building in this area shows an increase of 150 per cent over last year at this time.

Industrial employment is up 5 per cent and payrolls 15 per cent over a year ago. Retail trade increased sharply during the last two weeks to a point 8 per cent over a year ago. Electrical Wholesalers report an increase in sales of approximately 9 per cent over March, 1938, while stocks showed a slight reduction. Electrical power output declined slightly from the previous week but increased the gain over the comparable week last year.

Contractors report slowly increasing activity, with rewiring work being especially beneficial. Motors and control equipment are in demand particularly by industrial plants. A prominent electrical appliance manufacturer will spend $160,000 to expand facilities. Small appliance sales are continuing to increase and the outlook for a good year is highly promising for large household items. Commercial lighting equipment sales showed an improvement over the early part of the month.

CENTRAL

Linemen's Flare Lights

"Packaged Sunlight" for night repairs and line patrol

A quickly available light—provides brilliant illumination for either 20 or 30 minutes. Not affected by wind, rain or snow.

Linemen's Flare Lights are invaluable during outages or other emergencies when quick illumination is imperative . . . ideal warning signals in case of truck breakdowns or when power lines are down on highways.

Equipped with friction cap ignition for instantaneous lighting — no matches required. Easily lighted in any weather. Linemen's Flares are equipped with spike point and removable handle permitting them to be carried in the hand on line patrol or stuck in a post, tree or pole cross arm. Standard equipment with many electric utilities throughout the United States.

Write for Prices

STANDARD PACKING

No. 3020 20 min. 72 per case—63 lbs.

No. 3030 30 min. 36 per case—50 lbs.

CENTRAL RAILWAY SIGNAL CO., INC.

NEWTON, MASS.

AMELECTRIC

WIRES AND CABLES

POWER CABLE
PAPER INSULATED
VARNISHED CAMBRIC INSULATED

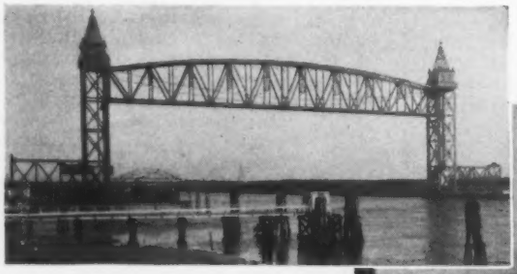
TELEPHONE CABLE
BARE COPPER WIRE AND CABLE
WEATHERPROOF WIRE AND CABLE
MAGNET WIRE
TROLLEY WIRE

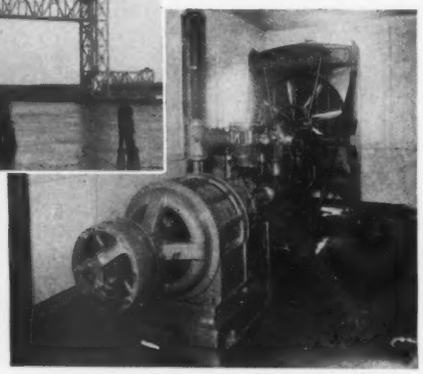
"QUALITY ABOVE SPECIFICATIONS"

KENNECOTT WIRE AND CABLE COMPANY
SUBSIDIARY OF KENNECOTT COPPER CORPORATION
PHILLIPSDALE, RHODE ISLAND
New York, 10 East 40th St. - Chicago, 140 South Dearborn St. - Cincinnati, Traction Bldg.

THE GOLDEN GATE BRIDGE — SAN FRANCISCO
TRIBOROUGH BRIDGE — NEW YORK
WELLAND CANAL BRIDGES — 20 — CANADA

The Pennsylvania Railroad Bridges, C. R. R. of N. J. Bridge, the D. L. & W. R. R. Bridges at Newark, the New York State Bridges at Albany, most all of the prominent bridges in the past 20 years have Sterling Engines, either for primary power or emergency.





Cape Cod Canal Bridge at Buzzards Bay, Massachusetts, project of U. S. Engineers, is equipped with 125 K.W. 1200 R.P.M. generator, driven by Sterling Dolphin C 8-cylinder gasoline engine.

STERLING HIGH DUTY INTERNAL COMBUSTION ENGINES

The accumulated data, covering all details required for a successful installation—yours on request.

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Home Office and Plant,
1270 Niagara Street
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Dept. C-2

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900 Chrysler Bldg.,
New York, N. Y.

Expulsion Tubes Decrease Wood Line Tripouts

[*Continued from page 47*]

The wood H-frame section of this line has three tubes mounted in a vertical position directly underneath the conductors on a steel channel crossarm. The channel iron crossarm is connected to both pole ground wires. The external gap setting for the tubes on this section of line is 11 in.

Operation Record of the Line

Switching of the line at the Laurinburg end is by means of an oil circuit breaker equipped with automatic reclosing devices to give one high-speed reclosure within 30 cycles and one delayed reclosure five seconds later. Relaying of the line is provided by instantaneous relays, the phase relays being set for 528 amp. and the ground relay for 180 amp. These relays operate in 3 to 4 cycles. Additional overload relaying is provided by induction type overload phase relays with a current setting of 150 amp. and an induction type overload ground relay with a current setting of 120 amp. The time lever setting for the phase relays is five and for the ground relay is 5.5.

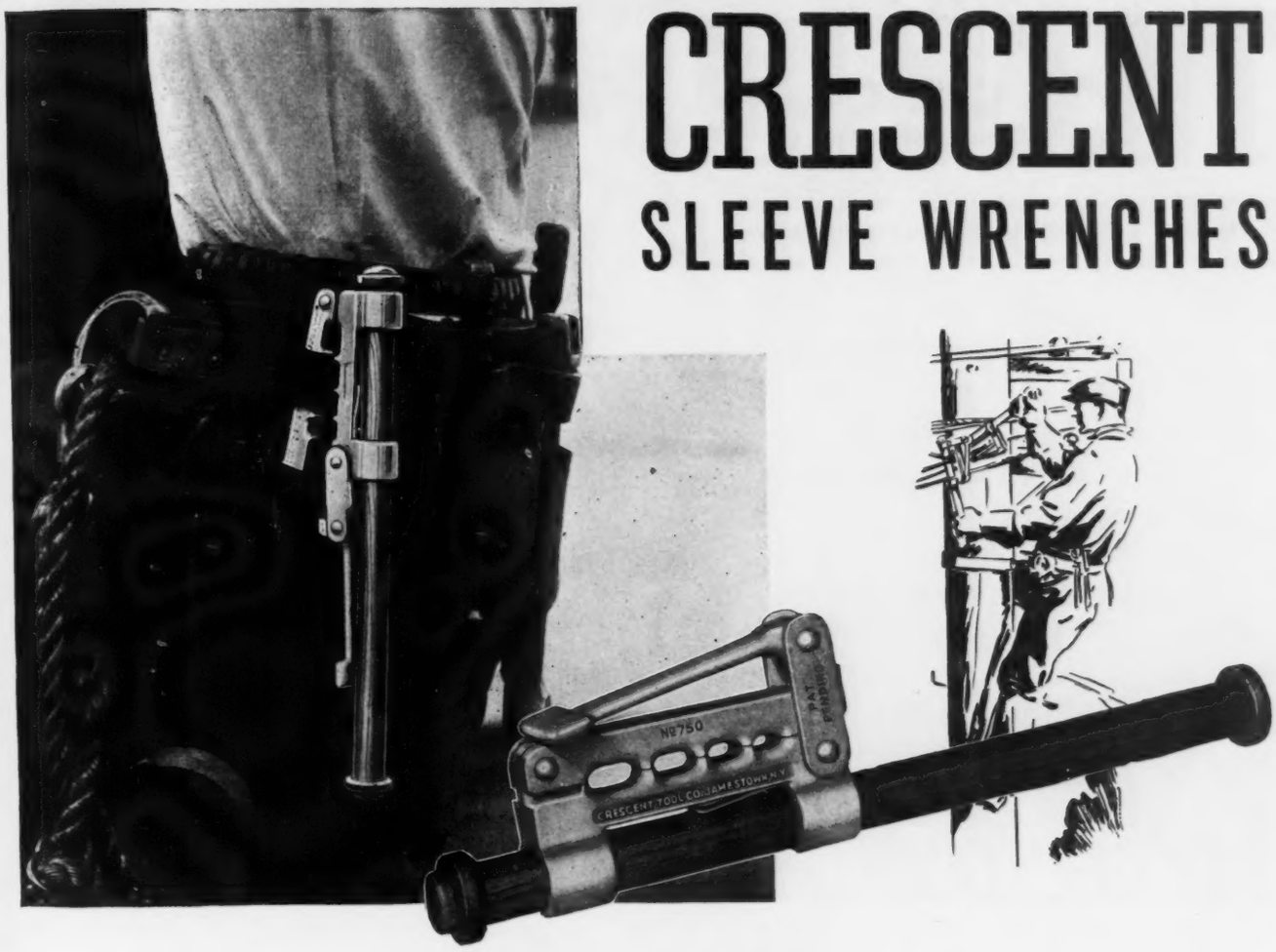
The table on page 47 shows the number of operations of the oil circuit breaker at Laurinburg attributed directly to lightning from June 1, 1934, to December 31, 1938.

Armor Rods Installed

During the 4½ years covered by this record there were no prolonged line outages attributed directly to lightning, although there was some conductor burning on the steel tower section of the line. All sections of burned conductor were replaced as soon as found, but two line outages due to wind and sleet were thought to have been caused by previous burning of the conductor.

During 1935 burned conductor was replaced at two towers. In 1937 an effort was made to find and repair all such damages, and damaged sections of conductor were replaced at twelve places near the insulator clamp and expulsion tube and at two points on the line between towers.

During the early part of 1938 armor rods were installed on all towers and at this time fourteen sections of damaged conductor near the suspension point and two sections near



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SLEEVE WRENCHES

FASTER, SAFER . . .
PRODUCE BETTER JOINTS

• Crescent No. 750 Sleeve Wrenches save time because they are fast and easy to use. They definitely reduce working hazards. And they produce a far better sleeve joint.

In the last five years these improved Sleeve Wrenches have been widely accepted by the industry. Field experience demonstrates that they insure 90 to 98% perfect joints. We can supply them in any selection of 146 different opening combinations. Ask your supply house, or write us for complete information.

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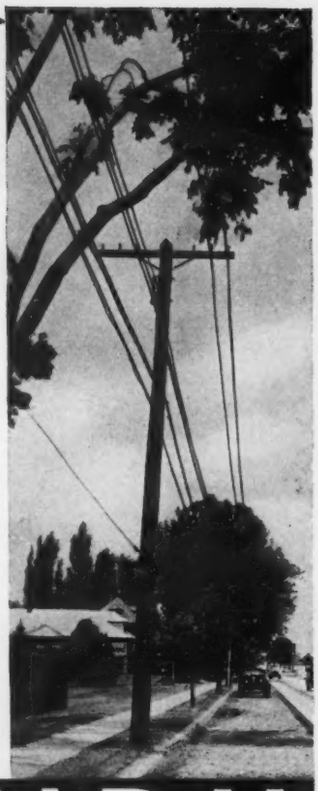

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the center of the span were replaced. The entire line was carefully inspected for conductor burns while the armor rods were being installed.

These armor rods are about 8 ft. long and ten are required for each installation. They extend from a point about 1 ft. from the center of the insulator through the conductor clamp and beyond the gap at the end of the expulsion tube.

Experience with the operation of this line during the lightning season last year indicates that the armor rods will be effective in reducing conductor damage due to expulsion tube operations and arc-over from the conductor to nearby parts of the tower.

During the 4½-year period covered by this report there were twelve line outages not attributable to lightning. In six cases the line was good after one to three reclosures and in six cases the faults remained on the line after three reclosures. All of these six faults occurred on the steel tower section of the line. Two were caused by ice, two by wind, then two towers were blown down, one by an automobile wrecking a tower and one by undetermined cause. The total outage time for the line due to these faults was 39 hours and 37 minutes.

The total outage time for the same period due to lightning was three minutes and ten seconds caused by 48 tripping operations at Laurinburg. Twenty-four of these were thirty-cycle interruptions which in some cases did not cause a shut-down of motor load. A 5,000-kva. synchronous condenser and about 3,000 kva. of synchronous motor load in and around Wilmington is usually shut down by these 30-cycle interruptions, but the other load usually is not affected. Under-voltage tripping devices for the condenser and the synchronous motors are set for a very short time to prevent sustaining the arc when an insulator flashover occurs.

Expulsion Tube Operations

The record of expulsion tube operations indicates that a number of line interruptions have been prevented by operation of the tubes to relieve the overvoltage condition caused by lightning discharges. It is believed that the record of these operations is incomplete and that there were many more successful tube operations of which there is no record. The expulsion tubes are equipped with operation indicators, from which the tube

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operations are determined by inspection on the line patrols. These operation indicators are hand reset, therefore a tube can operate several times between patrols, but only one operation will be recorded.

The following tabulation gives the record of tube operations since the line was put in service as an interconnection between the two systems in 1934:

Year	Tube Operations—Tower Line	Tube Operations—H-Frame Line	Storm Days
1934	92	22	78
1935	37	7	56
1936	24	3	52
1937	32	35	73
1938	18	19	71
Total	203	86	330

Of the tube operations on the double-circuit steel tower line 47 per cent were on the top wire, 32 per cent on the middle wire and 21 per cent on the bottom wire. The three conductors are suspended in the same vertical plane. On the single-circuit tower line the tube operations were distributed as follows: Thirty per cent on the top wire, 32 per cent on the middle wire and 38 per cent on the bottom wire, indicating less effective shielding of the bottom wire. Seventy per cent of the tube operations on the wood H-frame line were on the two outside wires and 30 per cent on the middle wire.

Ground Resistances

Available operating data for the wood H-frame line did not show any effect of various ground wire resistances upon the number of tube operations at a particular structure. No tube failures have occurred on this section of line, and although some of the ground resistances are well over 200 ohms, it appears evident that the ground resistances are not high enough to prevent normal expulsion tube operation.

If the tube is able to carry the power follow current long enough for the relays and oil circuit breaker to operate, the tube operation at a point of unusually high resistance might cause tripping of the line because the current value is below the minimum rating of the tube without leaving any visible sign except possibly a burned target. However, 35 of the 48 tripping operations involved one or more of the instantaneous phase relays requiring minimum operating current of 528 amp., which is well above the minimum operating current of the tubes on the wood H-frame section of

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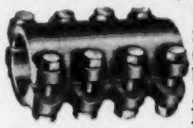

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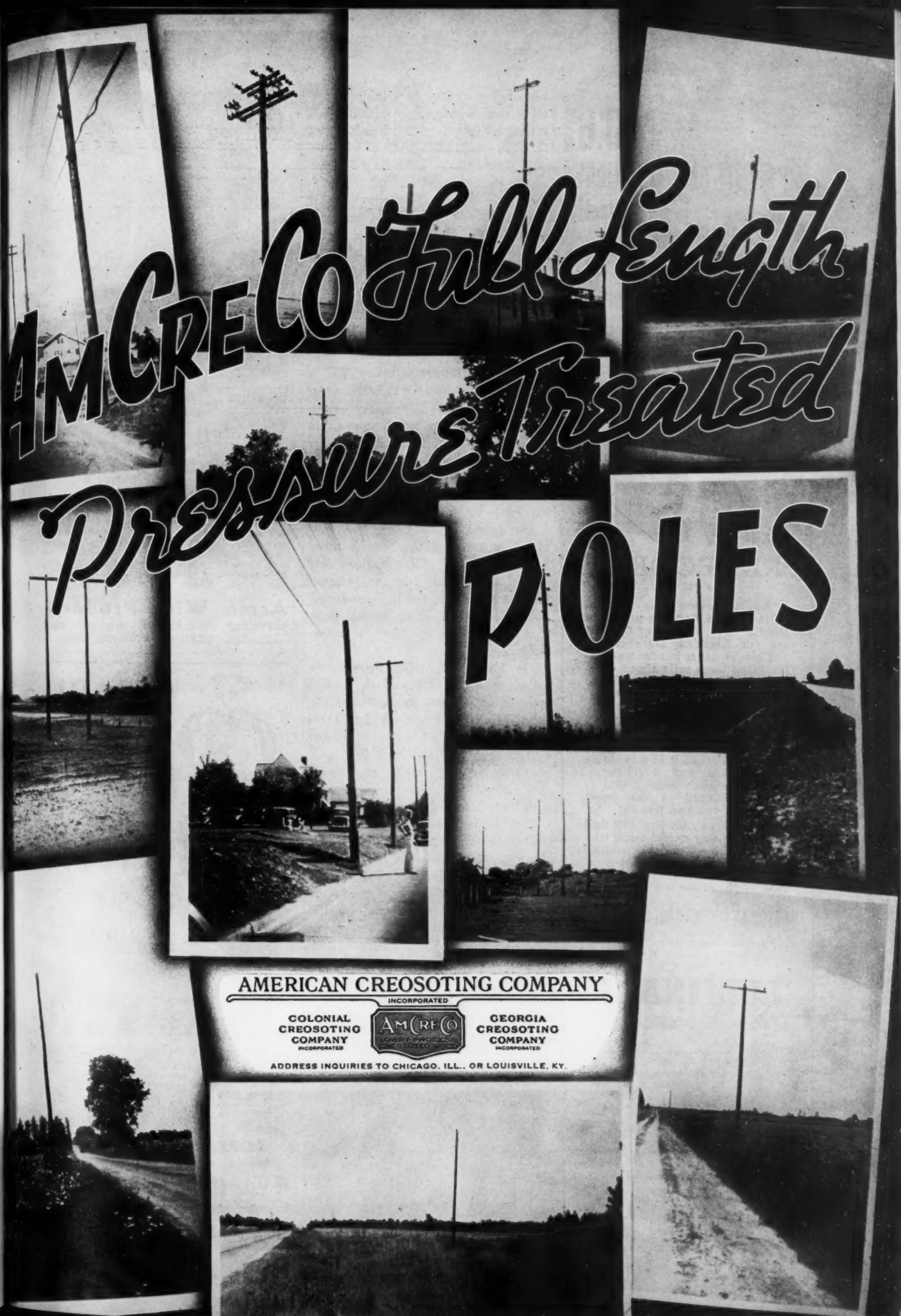
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line. Seven of the remaining operations were by overload relays with a setting of 120 amp., but it is believed that the long time setting of these relays would allow considerable damage to the tube and conductor due to the follow current. The remaining six operations were by the instantaneous ground relay which has a setting of 180 amp. Some or all of the latter six operations may have been caused by failure of a tube to extinguish the arc, but no proof of this has been found in the operating record.

Ratings, Failures, Flashovers

From Laurinburg to tower 357, or about half the distance to Lumberton, the tube rating is 2,500 amp. maximum to 600 amp. minimum. From tower 358 to Lumberton on the steel tower section and from Lumberton to Abbottsburg on the wood H-frame line the tube rating is 1,600 amp. maximum to 350 amp. minimum.

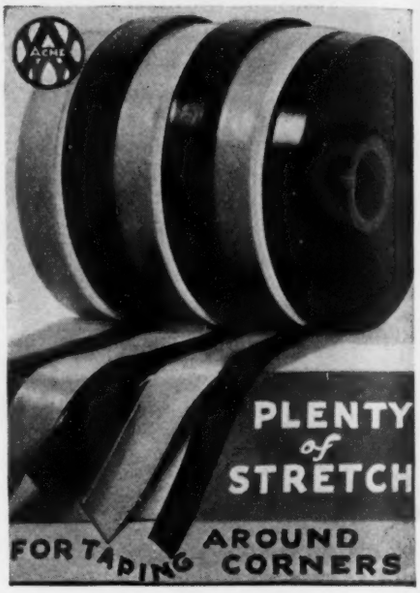
On January 26, 1936, one tube failed at tower 256, about 3 miles from Laurinburg. This failure was caused by a change in the external gap setting due to the line conductor being pulled out of its normal position when replaced after a breakdown.

On March 26, 1938, three tubes failed at tower 359, which is two spans beyond the point where the tube rating changes from 2,500-600 amp. to 1,600-350 amp. A power follow current in excess of the expulsion tube capacity might have caused this failure, although no other failures have occurred in this vicinity.

It is evident that most of the conductor burning that has occurred on the steel tower line has been caused by flashes which were outside the tube because no serious conductor burning has been reported on the wood pole section of the line, where external tube flashover has been very rare. Some of the conductor burning which has been repaired recently may have occurred prior to the installation of the tubes, but it is impossible to determine from the operating record how much of this damage has been caused by flashes during the period of operation with the tubes.

From the information that is available it appears likely that failure of the tubes to prevent line trip-out due to lightning surges can be attributed to one of the following causes:

1. Mid-span flashover.
2. Multiple lightning strokes caus-



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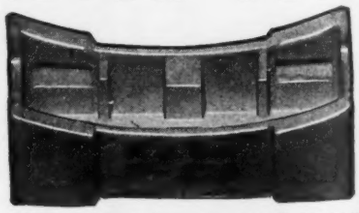

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ing repeated operations of the tubes of sufficient duration to operate the relays.

3. Flashover outside the tube.

4. Failure of the tube to extinguish the arc due to low current.

5. Bursting and failure of the tube due to excessive current.

Evidence has been found of mid-span flashover at four points on the steel tower section of line, but it is now known that all of these flashovers occurred since the expulsion tubes were installed.

Flashover outside the tube seems to be the most prevalent cause of line trip-outs and it is believed that most of the trouble of this nature has occurred on the steel tower section of the line. At this time no easily applied means of reducing this kind of trouble has been found.

From the available information, it is impossible to determine whether some of the line trip-outs were caused by bursting of the tubes due to excessive current. Three of the tubes that failed in this manner were on the same tower and probably failed at the same time.

•

Twentieth Century Fund To Make Utility Survey

Dr. Arthur Robert Burns, Columbia University economist, has been appointed research director of the Twentieth Century Fund's survey of the problems arising out of government relations with the light and power industry.

The fund's non-partisan appraisal of these controversial issues in the electrical utilities field will be made under the guidance of and in consultation with a special fund committee headed by J. Henry Scattergood, former Public Service Commissioner of Pennsylvania and a director of several corporations. Findings will be published in book form.

•

Pacific Gas to Sell Bonds

Pacific Gas & Electric Co. has filed an application with the California Railroad Commission for authority to issue and sell $425,000 par value of its first and refunding mortgage 3¾ per cent bonds due 1961. These bonds will not be offered to the public. It is the company's intention to tender the bonds to the trustee of the first and refunding mortgage for the investment of money now held in the mortgage sinking fund by the trustee.

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Yet it can be measured in valuable
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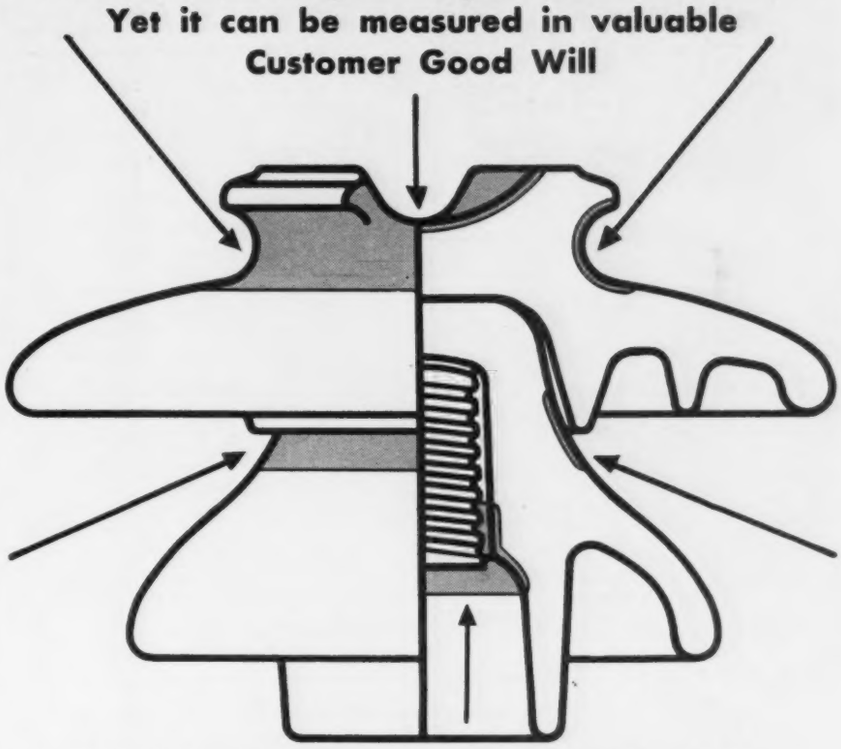

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- ☐ Pocket Tool Guide.

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Sales Opportunities

PORT ARTHUR, TEX.—Texas Company, Houston, Tex., has approved plans for new steam-electric generating plant at oil refinery at Port Arthur, with installation to include steam turbo-generator units and accessories, three high-pressure boilers and auxiliary equipment. Cost estimated close to $1,000,000, with equipment. Completion is scheduled in the fall. Jackson & Moreland, 31 St. James Street, Boston, Mass., are consulting engineers.

CLEVELAND, OHIO—Republic Steel Corporation, Republic Building, plans installation of heavy-duty mill motors and controls, conveyors, regulators, electric hoists and other equipment in connection with expansion and improvements in branch mills at Massillon and Warren, Ohio, respectively, to increase capacity of stainless steel at first noted plant, and output of cold-rolled carbon strip steel at Warren mill. Work will be placed under way at once. Cost reported in excess of $500,000.

WASHINGTON, D. C.—Bureau of Yards and Docks plans installation of motors and controls, switchgear, conveyors, electric hoists and other equipment in new group of shop buildings at navy yard at Pearl Harbor, T. H., to include an electric shop unit, estimated to cost $465,000, with equipment; pipe and copper shop, cost about $150,000; storehouse building with equipment, $750,000; public works shop and storage building, $170,000; ordnance shop, $165,000, and other structures. Two new graving docks are planned at same yard, one for large vessels, estimated to cost $8,485,000, and the other for smaller vessels, to cost close to $2,000,000, both with complete electrical and mechanical operating facilities. Appropriation is being arranged.

HARTLEY, IOWA—Closes bids on April 25 for extensions and improvements in municipal electric power plant, including installation of new equipment. No estimate of cost announced. Gwen Guenther, town clerk, in charge.

CASPER, WYO.—Mountain States Power Company, Tacoma, Wash., plans new power substation at North Jasper, to cost close to $85,000, with transformers, switchgear and accessory equipment. Work is scheduled to begin this spring.

PORTLAND, ORE.—Administrator, Bonneville Project, Department of Interior, 811 N. E. Oregon Street, Portland, receives bids until April 17 for two 25-kv. oil circuit breakers for Raymond, Wash., power substation of Bonneville system (Circular 217); also until April 20 for two motor-driven oil transfer pumping units, capacity 50 gallons per minute under a 110-foot head, complete with three-phase, 220-volt, 60-cycle motors (Circular 218).

DENVER, COLO.—State Department of Public Buildings, State Capitol, James Merrick, superintendent, has completed plans and will take bids soon for general erection and equipment for new one-story steam-electric power plant on Sherman Street, near Fourteenth Street, for service for state-owned buildings, including one-story shop unit adjoining. Cost about $300,000, with equipment. Gordon D. White, 615 Columbine Street, Denver, is architect.

LONG BEACH, CALIF.—Northrop Aircraft, Inc., 6824 McKinley Avenue, Los Angeles, Calif., John K. Northrop, president, plans installation of motors and controls, conveyors, electric hoists and other equipment in new aircraft-manufacturing plant at Long Beach, where company has taken option to purchase tract of about 20 acres of land in vicinity of municipal airport. Initial unit will total about 100,000 square feet of floor space and will be used for parts production and assembling. Cost estimated close to $500,000.

MONTEZUMA, IOWA—Has tentative plans for new municipal electric power plant with electrical distributing system. Cost estimated about $135,000. Proposed to hold special election in April to vote on bond issue in such amount. C. F. Dickson is town clerk, in charge.

FORT WAYNE, IND.—Indiana Service Corporation, Fort Wayne, is considering plans for expansion and improvements in local Spy Run steam-electric generating station, including installation of additional equipment. Cost estimated about $260,000. Also will make extensions in transmission and distributing lines at Fort Wayne and vicinity, including additions to underground conduit system in downtown district of city. Cost approximately $120,000.

VILLISCA, IOWA—Receives bids until April 18 for extensions and improvements in municipal electric power plant, including installation of additional equipment. A. S. Harrington, Baum Building, Omaha, Neb., is consulting engineer.

SOUTH ROYALSTON, MASS.—Mason & Parker Manufacturing Company, Winchendon, Mass., plans installation of motors and controls, conveyors, loaders and other equipment in connection with proposed rebuilding of toy-manufacturing plant at South Royalston, comprising group of six buildings, recently destroyed by fire. Loss over $200,000.

AUSTIN, TEX.—Lower Colorado River Authority, Littlefield Building, Austin, receives bids until April 28 for electric generators, hydraulic turbines and auxiliary equipment for hydroelectric generating station at Marshall Ford Dam.

PARKER, ARIZ.—Bureau of Reclamation, Denver, Colo., has authorized surveys for new high-tension transmission line from Parker to Phoenix, Ariz. Estimated cost about $1,300,000, including power substations, switching stations and other operating facilities.

SAN FRANCISCO, CALIF.—Procurement Division, Treasury Department, Washington, D. C., plans installation of motors and controls, conveyors, electric elevators, electric operated doors, regulators and other equipment in new three-story parcel post building, about 270 x 300 feet, on block bounded by Mission, Howard, Steuart and Spear Streets, San Francisco, for which bids are being asked on general erection until April 18. Cost estimated about $2,000,000.

DENVER, COLO.—Bureau of Reclamation, Denver, will secure appropriation of about $10,000,000 through general fund of Department of Interior for 1940 fiscal year, to be used for Central Valley project, California, of which about $6,675,000 will be used for construction of Shasta dam, and $300,000 for hydroelectric generating station. Remainder of fund will be used for Friant dam and other work on project.

NEWPORT NEWS, VA.—Newport News Shipbuilding & Dry Dock Company plans installation of motors and controls, switchgear, conveyors, electric hoists and other equipment in connection with expansion and improvements in shipbuilding plant, comprising several new shop and construction units, and other buildings. Work is scheduled to proceed at once. Cost about $1,000,000.

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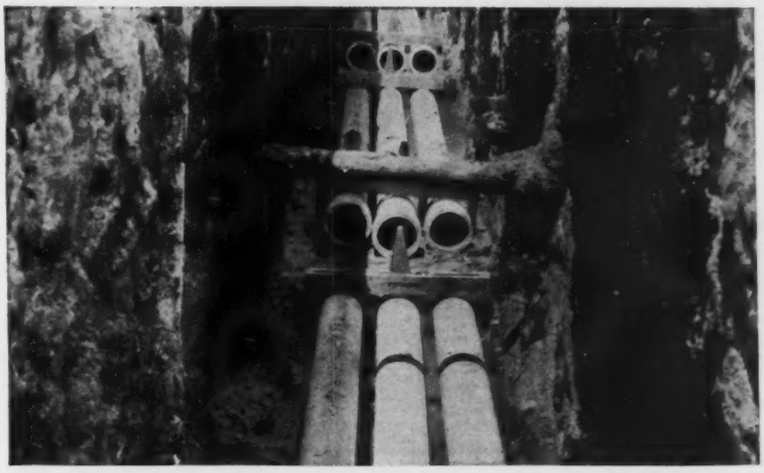

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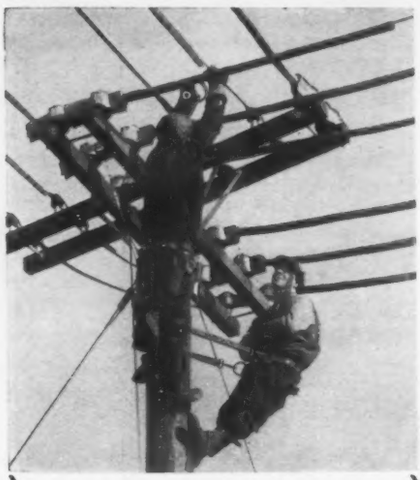

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Recent Rate Changes

CONSUMERS POWER CO.'s electricity consumers in Adrian, Mich, and surrounding rural territory have received new rate schedules, to save home users $36,000 annually. Commercial users will have $14,000 annually through a 12 per cent reduction. The new residential rate is 5 cents per kilowatt-hour for the first 15 kw.-hr.; 4 cents per kilowatt-hour for the next 15 kw.-hr.; 3 cents per kilowatt-hour for the next 125 kw.-hr., and 1½ cents per kilowatt-hour for all other electricity used.

OHIO PUBLIC SERVICE CO. put into effect on March 18 new electric light rates at 20 per cent reduction in Warren under a five-year franchise. Refunds on the rates collected since last December 1 will be made with April bills, the utility company announced, in accepting the new franchise. Under the new rates the city will pay the $30,000 street light bill which, for the past five years, has been absorbed in the domestic rate. The change will give users 100 kw.-hr. at $4.03 instead of $4.85; and 150 kw.-hr. at $5.28 instead of $6.35.

LONG ISLAND LIGHTING CO. has filed with the New York Public Service Commission a schedule of electric rates, revising existing demand charges. The new rates, according to James C. Carpenter, a vice-president of the company, will mean a reduction of about $60,000 a year in consumers' bills. The rates, members of the commission agreed, appeared to embody a more equitable method of assessing demand charges, even though some bills would be increased under the revised set-up.

MESILLA VALLEY ELECTRIC CO., Las Cruces, N. M., has put into effect a $20,000 light and power rate reduction to commercial and residential customers and the town of Las Cruces. An agreement has been reached between the Mesilla Valley Electric Co. on the one hand and the town of Las Cruces and Hatch on the other. The reductions to Las Cruces are distributed as follows: commercial customers, $9,464; residential, $9,926; and Las Cruces and street lighting, $296. The agreement gives the Mesilla Valley Electric Co. the right to distribute power derived from Elephant Butte Dam until such time as the town of Las Cruces may establish a municipal light plant and power system. The company will distribute the Elephant Butte power, if and when furnished, through the El Paso Electric Co.

ILLINOIS COMMERCE COMMISSION has announced that electric rate reductions in the state which became operative in February amounted to $115,842.

NEW YORK STATE ELECTRIC & GAS CORP. has filed with the state Public Service Commission reduced rates for residential use of electricity in the Ithaca district. The lower rates are estimated to save customers in this territory approximately $51,000 annually. The commission permitted the new rates to become effective at once.

MOHAWK, N. Y., municipal electric plant has filed a general reduction of electric rates with the state Public Service Commission which will save consumers about $3,000 annually. The commission allowed the decreased rates to become effective April 15.

PONCA CITY, OKLA., municipal electric plant has reduced electric rates approximately $27,000 annually. The new rate schedule broadens the base to allow 13 kw.-hr. for $1.

Municipal Plants

FORT PAYNE, ALA.—Alabama Supreme Court has reversed a previous ruling upholding refusal of Montgomery Circuit Court to investigate the State Public Board approval of a $73,000 bond issue by the city for construction of a municipal system for distribution of TVA power. In remanding the cast to Montgomery Circuit Court for further hearing, the Supreme Court held the Alabama Public Works Board approved issuance of the bonds without sufficient evidence that the municipal system in the city now served by the Alabama Power Co. would serve a public need and would be in the public interest.

BARBOURVILLE, KY.—State Public Service Commission has announced the grant of a certificate enabling the city to buy the electric transmission system of the Kentucky-West Virginia Utilities Co. for $75,000. The plant will be operated by the municipality.

BAYARD, NEB.—Federal Judge Donohoe has issued a temporary order restraining three district judges and the city from continuing with condemnation proceedings against the local holdings of the Western Public Service Co. The court held the property to be condemned is not properly described in the proceedings and is inadequate for condemnation. A hearing on the permanent injunction will be held in May.

NORTH BALTIMORE, OHIO—Hearing on a petition filed by 24 residents, contesting a recent special election for a municipality owned electric power plant, will be held April 20 and 21 at Bowling Green. The petition listed 17 alleged reasons why the election should be declared null. Election was a referendum on legislation adopted by the village council.

SWEETWATER, TENN.—In a referendum election by a vote 445 for and 10 against the bond issue for a municipal power system was favored on March 17.

MULLENS, W. VA.—Voters will decide April 22 whether or not they want the town council to take over the Home Electric Co., which supplies the town with electric service and water.

WHITEHALL, WIS. — Northern States Power Co., has filed in Dane County Circuit Court an appeal from the Wisconsin Public Service Commission's decision authorizing the village to purchase the local electric facilities of Northern States for $30,000. The utility company protests that the valuation set by the commission is too low and demands that the whole commission order be vacated.

•

Will Redeem Debentures

Gulf States Utilities Co. has called for redemption all of its ten-year 4½ per cent debentures, due October 1, 1946, and outstanding in the amount of $3,286,000, at 102½ per cent of their principal amount plus accrued interest to the redemption date. The company also plans to retire a $1,500,000 loan carrying 4 per cent interest made by an industrial customer for construction. Funds for the retirement of these obligations will be provided in part from the proceeds of a loan of $4,000,000 from Chase National Bank of New York, to bear interest at 3 per cent and mature serially over 6½ years.

Recent Legislation

Action has been taken by the various state legislatures on the following measures affecting the electric light and power industry:

INDIANA—Gov. Townsend has signed a number of bills recently passed by the legislature. One clarifies the right of refunding by utilities which have a funded debt in excess of authorized limit, another requires second class cities which operate two or more municipal utilities to create a pension fund for employees, affecting Fort Wayne directly. Another permits municipally owned utilities to form a retirement fund for employees with the utility matching contributions of employees to create the fund. Under the terms of another measure the Indianapolis utility district might buy either the electric or water utilities serving the city, with the approval of the mayor, the city council and the governing body of the district. One which was not signed by the governor, but which goes into effect without his signature, is the bill which exempts municipally-owned utilities from paying property taxes levied by any governmental unit of the state. The House bill which permits Indiana REMCs to carry their transmission lines across the state boundaries, passed the Senate 41 to 0. House bill, amending the REMC act to permit similar organizations in adjoining states to serve Indiana territory that cannot be served profitably by Indiana REMCs, passed the Senate 42 to 0.

MICHIGAN—State board of tax administration has sent to the Legislature a bill to subject municipal gas, electric power and steam sales to the state 3 per cent sales tax, and to make the sales tax a preferred claim in bankruptcy. Orville E. Atwood, business manager of the board, said he could see no reason why municipal utilities should be exempted.

MINNESOTA—Senate tax committee approved bills to permit rural electrification projects to pay annual fees at the rate of $10 per 100 members as a replacement for all local and state taxes.

MISSOURI—Rural Electric Co-operative Act introduced in the House provides for formation of non-profit co-operative corporations to furnish electric energy to their members in rural areas.

PENNSYLVANIA—Gov. Arthur H. James has signed a bill which denied the Pennsylvania Public Utility Commission authority to fix rates charged by municipally owned utilities. The measure was passed by the Senate by a vote of 28 to 18 and by the House by a vote of 123 to 61. A four-mill capital assets tax on public utilities for 1939 and thereafter would be imposed under a measure introduced in the legislature.

WISCONSIN—Governor Julius P. Heil has signed a bill withdrawing financial support from the Wisconsin Development Authority. The repealer was passed by both houses of the State Legislature. A bill to create a division of rural electrification co-ordination in the Wisconsin department of agriculture and markets and appropriate $5,000 for the work was introduced in the State Assembly. The new division would be limited in power to gather, digest and disseminate information on rural electrification to rural electric co-operatives and to co-operate with the federal REA. Provision is made that the director of the division shall have the approval of the REA and three-fourths of the state's electric co-operatives.

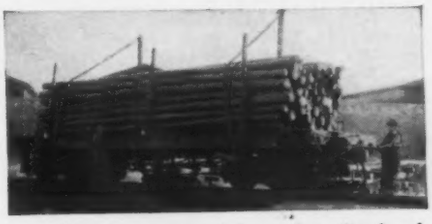
THIS APPROVED METHOD GIVES *YOU* SAFER FASTER POLE UNLOADING

• *View of Car braced with Acme Unit-Load Bands*

The Acme Unit-Load Method of bracing cars of poles for shipment has been approved by the Loading Rules Committee of the A.A.R. And because it enables safer, faster, more economical *unloading* it is preferred by more and more pole receivers in all parts of the country.

The low-cost, Unit Load Method, developed by Acme, is simple and easy to apply. The flat Acme Bands are placed around the load and across the stakes then tensioned and sealed. The danger of damage, delay or loss in transit is eliminated.

The procedures suggested for safer, faster and more economical unloading are contained in the illustrated booklet—"Pole Shipments and Unloading Procedures"—a copy should be in your files for ready reference. Write for it today—it may be the means of helping you increase safety—decrease costs.



• *Showing how safely and easily bands are removed from side opposite unloading side.*

• *Tension is gradually eased and poles roll safely off the Car.*

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Send me a copy of the booklet about POLE SHIPMENT with suggested *safe* Unloading Procedures.

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INSURES SPEED FOR EMERGENCIES

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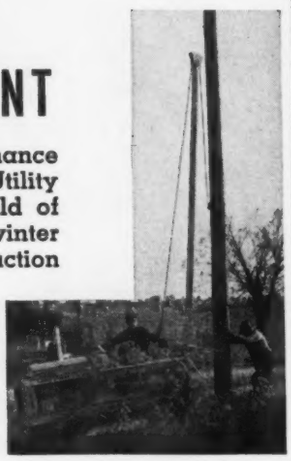
Highway Power Line Construction and Maintenance Equipment is specifically designed for Utility Service. Highway designs come from the field of actual experience. Don't be caught short this winter —equip now with modern Highway Construction and Maintenance Tools.



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Reduce the time element in every operation and lighten the amount of manual labor. Dig through frozen ground—at different angles—and hard-to-get-at places. Restore storm-wrecked lines to permanent service with less than half the usual delay. Many types and sizes available for mounting on truck or tractor.

HIGHWAY WINCHES

Easier to use . . . smooth operation under heavy duty . . . save costs in time, labor, maintenance . . . there's a type for every need — even light enough for use on 1½- and 2-ton trucks.

HIGHWAY POLE and CABLE REEL TRAILERS

We make a wide line of pole trailer and combination pole and cable reel trailers to economically meet every requirement. See catalog.

HIGHWAY DERRICKS

In sizes and capacities for any height and weight of pole. Safety and dependability under all operating conditions. Easily, quickly assembled and disassembled.

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Drawbars, Towing Hooks, Automotive Pintle Hooks, Pay Out Reels, Collapsible Power Reels —see catalog for complete descriptions.

WRITE FOR CATALOG

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

Rural Allotments; New Contracts Let

REA has recently announced allotments totaling $3,056,000 for 35 projects in nineteen states. This brings allotments made by REA since it was established in 1935 to $196,535,730. Among the allotments were the following:

ARKANSAS—Carroll Electric Co-op. Corp., Berryville, Paul F. Arnold, supt., $283,000 to build 307 miles of line, 1,016 members in Benton and Washington counties, Ark., and McDonald County, Mo.

FLORIDA—Sumter Electric Co-op. Assn., Inc., Bushnell, J. G. Sparkman, supt., $138,000 to build 173 miles of line, 550 members in Marion, Levy, Sumter, Citrus and Lake counties.

ILLINOIS—Norris Electric Co-op., Newton, C. E. Urfer, pres., $240,000 to build 215 miles of line, 806 members in Cumberland, Effingham, Crawford, Richland, Jasper and Clark counties. Southern Illinois Electric Co.-op., Inc., Mounds, J. C. McCormick, pres., $200,000 to build 194 miles of line, 635 members in Pulaski, Alexander, Massac, Johnson and Union counties.

IOWA—Plymouth Electric Co-op., Assn., Le Mars, W. G. Anderson, pres., $145,000 to build 144 miles of line, 324 members in Plymouth County. Ida County Rural Electric Co-op., Ida Grove, Earl R. Graham, pres., $167,000 to build 163 miles of line, 395 members in Ida County.

MISSISSIPPI—Tallahatchie Valley Electric Power Assn., Batesville, William H. Saxton, supt., $117,000 to build 145 miles of line, 490 members in Tate, Panola, Lafayette, Marshall, Grenada, Tallahatchie and Quitman counties.

MONTANA—Jefferson Valley Rural Electric Co-op., Inc., Twin Bridges, William Heaston, supt., $94.000 to build 80 miles of line, 267 members in Beaverhead, Jefferson and Madison counties.

OKLAHOMA—Harmon Electric Co-op., Inc., Hollis, H. G. Templeton, pres., $233,000 to build 250 miles of line, 731 members in Harmon, Greer and Jackson counties.

SOUTH CAROLINA—Aiken County Rural Electrification Assn., Aiken, T. W. Henderson, supt., $140,000 to build 174 miles of line, 518 members in Edgefield, Saluda and Orangeburg counties.

TEXAS—Bandera County Electric Co-op., Inc., Bandera, Raymond Hicks, pres., $154,000 to build 202 miles of line, 460 members in Bandera and Uvalde counties. Medina Electric Co-op., Inc., Hondo, H. H. Decker, pres., $101,000 to build 124 miles of line, 319 members in Medina County.

VERMONT—Vermont Electric Co-op., Inc., Eden Mills, Harry D. Bowman, supt., $70,000 to build 60 miles of line, 165 members in Orleans, Lamoille, Chittenden and Franklin counties.

VIRGINIA—Central Virginia Electric Co-op., Lovingston, L. A. Bress, supt., $212.000 to build 166 miles of line, 726 members in Appomattox, Prince Edward, Buckingham, Cumberland, Louisa, Albermarle, Fluvanna, Amherst and Nelson counties.

Construction contracts recently approved by REA follow:

South Alabama Electric Membership Corp., Troy, Ala., James H. Schuessler, supt., and Gordon Persons, Montgomery, Ala., engineer, contract to W. L. Coston and Sons, Bessemer, Ala., for building another section of project, 265 miles of line, 650 members; bid $142,553.

Colquitt County Rural Electric Co., Moultrie, Ga., Oscar O. Owens, mgr., E. P.

McLean Engineering Co., engineer, contracts for building two additional sections of project, one to the Coffee Construction Co., Eastman, Ga., 112 miles of line, 364 members; bid $69,287; the other to Bigby Electric Co., Tampa, Fla., 142 miles of line; 426 members; bid $72,285.

Wayne-White Counties Electric Co-op., Fairfield, Ill., C. W. McCullough, supt., and Warren and Van Praag, Inc., Decatur, Ill., engineer, contract to James and Shinn Co., Mattoon, Ill., another section, 215 miles of line, 761 members; bid $166,735.

Edgar Electric Co-op., Assn., Paris, Ill., Orval J. Bandy, supt., and Laramore and Douglas, Chicago, engineer, contract to A. S. Schulman, Chicago, first section, 280 miles of line, 613 members; bid $176,581.

McDonough Power Co-op., Macomb, Ill., Ray Grigsby, supt., and R. A. Donahue, engineer, contract to White City Electric Co., Chicago, first section, 277 miles of line, 580 members; bid $192,138.

Decatur County Rural Electric Membership Corp., Greensburg, Ind., Elmer D. Evans, supt., and Indiana Statewide REMC, Indianapolis, engineer, contract to Cater Construction Co., Kansas City, Mo., entire project, 272 miles of line, 780 members; bid $191,789.

Jasper County REMC, Rensselaer, Ind., Walter Emmert, supt., and Indiana Statewide REMC, Indianapolis, engineer, contract to Cater Construction Co., Kansas City, Mo., entire project, 222 miles of line, 593 members; bid $163,268.

Maquoketa Valley Rural Electric Corp., Anamosa, Iowa, Edgar D. Beach, manager, and K. R. Brown, Des Moines, Iowa, engineer, contract to Sandberg and Johnston Construction Co., Hampton, Iowa, another section, 250 miles of line, 476 members; bid $171,717.

West Kentucky Rural Electric Co-op., Mayfield, Ky., Robert S. Usrey, supt., and Ray W. Chanaberry, Louisville, engineer, contract to R. H. Bouligney, Inc., Charlotte, N. C., entire project, 203 miles of line, 548 members; bid $126,289.

Missouri Rural Electric Co-op. Assn., Palmyra, Mo., H. C. McAfee, mgr., and R. A. Donahue, Macomb, Ill., engineer, contract to Phelan Construction Co., Davenport, Iowa, another section of project, 61 miles of line, 110 members; bid $40,915.

Guernsey-Muskingum Electric Co-op., Inc., New Concord, Ohio, H. B. Smith, supt., Putnam and Woolpert, engineer, contract to the D and W Construction Co., Columbus, Ohio, another section, 258 miles of line, 864 members; bid $194,054.

Southwest Rural Electric Co-op., Tipton, Okla., Tom Moran, supt., and Midwestern Engineering and Construction Co., Tulsa, engineer, contract to the B and M Construction Corp., Oklahoma City, another section, 160 miles of line, 350 members; bid $97,300.

Central Rural Electric Co-op., Assn., Clearfield, Pa., James B. Byers, supt., and Gibbs and Hill, Inc., New York City, engineer, contract to Day and Zimmermann, Philadelphia, another section of project, 195 miles of line, 550 members; bid $159,653.

Clay-Union Electric Corp., Vermillion, S. D., Ross Fowler, supt., and Buell and Winter Engineering Co., Sioux City, engineer, contract to H. A. Risk Pipe and Construction Co., Nebraska City, Neb., another section, 55 miles of line, 131 members; bid $40,484.

Wharton County Electric Co-op., Inc., Danevang, Tex., E. G. Petersen, supt., and William G. Morrison, Waco, Tex., engineer, contract to Uvalde Construction Co., Dallas, Tex., for building entire project, 244 miles of line, 410 members; bid $117,330.

Highway BODIES

—have ample roominess
—offer comfort to the crew
—are convenient in arrangement
—are lightweight yet rugged
—are designed for utility service
—are fully dependable

Save money over longest service periods with Highway truck Bodies

—they answer every need because they were designed around utility service needs. They are modern in every respect — every unit of space is advantageously utilized. Standard equipment includes Highway Winches, Derricks, Tools, Racks, etc. Get the facts—write today.

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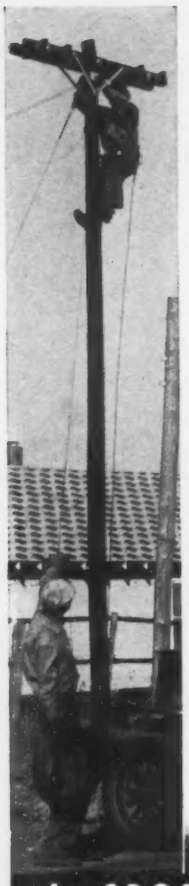

Heavy Duty or Rural, it's "DIXIE"

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POLES

Cross-country or rural, "DIXIE" all dense longleaf Poles meet every requirement for strength, straightness and resistance to weather, decay and insects. Properly seasoned. Correctly graded. Available untreated or pressure-treated (Creosoted or "Wolmanized"). Large stocks of all standard sizes for prompt shipment. Let us quote on your requirements.

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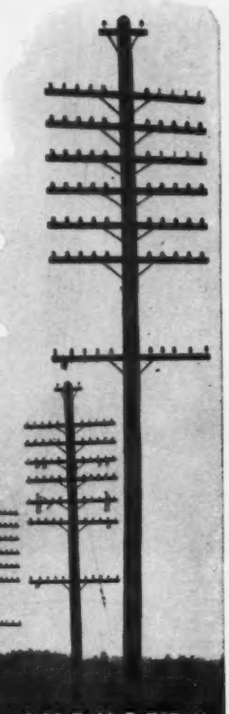

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FIRST
In Dependability and Safety!
Made of Malleable Iron—proven on the toughest guying jobs—you can't go wrong by using Eversticks exclusively.
THE EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA
Nut Housing locks EVERSTICK firmly on rod.
POWER TO HOLD

HIGH GRADE
HARD PORCELAIN
FOR
Electrical Specialties
High and Low Voltages

IMPERIAL
PORCELAIN WORKS
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G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue

We have been making safety tools for 24 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

Knuckle Cracking

[*Continued from page* 56]

Scarcely a picture calculated to produce this flood of investment funds into industry! But that was not the worst of it. President Roosevelt knew perfectly well what he was doing when he laid down this law about keeping up the *estimated* revenues.

Don't overlook that word "estimated." Roosevelt did *not* use it, but it is of the essence.

The Treasury experts had figured that they would sharply reduce *estimated* revenue from corporations, hoping that a business revival would swell enormously not only corporation income tax receipts, but individual income tax receipts as well. The President deliberately ignored this very foundation of the idea. He insisted on talking only about *estimated* revenues. He talked as though the budget were precisely balanced, and hence any cut in revenues must be met by an equal cut in expenditures.

What Mr. Roosevelt accomplished by that dictum—assuming Congress does not override him, which does not seem likely at the moment—was to divide business sharply into two groups as to tax revision. Every corporation would study any revision proposal. If it appeared that it would save the company money, the company would be on the side of revision. If it appeared that it would cost the company money, obviously the company would fight revision.

Thus the President would be sure of having roughly one-half of the corporations on his side *against* revision. Why did he want this to be the situation? Because he doesn't want any tax revision. And why not? Because if there were a vote in Congress any time soon both House and Senate would vote overwhelmingly to remove the last vestige of the tax on undistributed earnings. Mr. Roosevelt still thinks that is a fine tax. He is not interested in it as a revenue producer at all, but as a reform measure. He hopes to see it restored.

Apparently that became of greater importance to him than the gamble on business recovery. One wonders if Electric Bond & Share and Commonwealth & Southern were not lucky to escape with their shirts *before* the ruler cracked!

"Just picture romance"

Electrical World's

PRIZE PICTURE CONTEST

1st prize.....$100
2nd prize 50
10 prizes of $10..... 100

THE electric light and power business from its very beginning has been full of romance. In the past few years, however, the gloom that has pervaded the industry has largely chased away the romance and with it much of enthusiasm and vision. To recapture this inspiration to serve—not for a day, not for a year, but for all time—ELECTRICAL WORLD offers a series of prizes for the best photographs by utility employees which bring out this Romance in the Electric Utility Business.

There is no phase of the business that does not have its Romance—A coalpile with three months supply is what? Just coal? No—insurance of service. Everywhere we have work or equipment that is inspiring.

Not only must the subject have its romantic side, but the picture by its composition must be romantic. And just to make sure that those who look at the photograph see what the camera man saw, each photograph must be accompanied by a romantic title, preferably not more than three or four words that bring out the romantic essence of the picture.

Read the rules of the contest and send in your entries. It is not necessary to be a subscriber to ELECTRICAL WORLD, but every entrant must be employed by an electric light and power company.

Subjects of Pictures

Any aspect of the business, power plant to customer premises and all between, may be shown in the pictures entered. The twelve prize-winning pictures and titles will be published in the June 3, 1939, issue of ELECTRICAL WORLD and will be exhibited in New York City at the time of the 1939 convention of the Edison Electric Institute. To avoid repetition in the series, effort will be made by the judges to select prize winners showing different kinds of subjects.

Titles

Each picture entered is to be accompanied by a title or caption calculated to bring out the significance of the picture, to provoke thought of its meaning in terms of the romance of the industry. This is an important element in the contest. The purpose of the caption is to "point up" the picture, to bring to instant perception its romantic value. For instance, the picture of a lineman working on a pole might be titled with that simple statement. But a more romantic caption would be, "Men + Electricity = Electric Service."

Judging and Judges

The twelve prize winners will be selected by three independent judges. One judge will be a photographer of recognized professional and artistic capacity; another will be a publisher or editor (not an ELECTRICAL WORLD man) capable of estimating publication values of entries; the third will be an electric utility executive. Names of judges will be announced later.

RULES—Contest is open to employees of all electric light and power companies in the U. S. and Canada.

Contestants may enter twelve pictures or any lesser number. It is suggested that no contestant enter more than one picture of any one kind of subject.

Each picture is to be accompanied by the negative from which it was made.

All prize-winning photographs and negatives become the property of ELECTRICAL WORLD. In addition to these prize-winning entries, ELECTRICAL WORLD reserves the right to retain any or all photographs and negatives submitted. For each picture, with negative, retained, entrants will receive $1. Those not retained will be returned to entrants on or before July 15, 1939.

Entrants receiving awards, in whose pictures persons appear identifiably, are to secure releases for publication signed by those persons on forms which will be furnished by ELECTRICAL WORLD.

Entries may be either contact prints or enlargements, must be unmounted and may be no smaller than 4 x 6 in. nor larger than 12 x 16 in.

On the back of each picture must be pasted—preferably with rubber cement—a slip of paper on which is typed or written in ink:

1. Name and address of the entrant.
2. Name and address of the company by whom entrant is employed.
3. Entrant's position or occupation in the company.
4. Entrant's title or caption for the picture (Remember—imagination, romance, significance, etc.).
5. Identification and description of the subject in a paragraph of 25 to 50 words. For instance, "Turbo-generator of —— kw. capacity, —— volts, —— r.p.m., steam at —— lbs., —— deg. F., exhaust to low pressure header at —— lbs., installed ———— in ———— generating station of ———— company.

The contest will close May 1, 1939, and all entries must be in the office of "Electrical World," 330 West 42d St., New York, N. Y., on or before that date. Winners will be notified as soon as the judges have made decisions.

ADD 7 TO 10 YEARS SERVICE LIFE TO STANDING POLES!

Prevent Groundline Decay

the **OSMOSE** *Way!*

EFFECTIVE! INEXPENSIVE!

One of a quantity of poles treated with OSMOSE by Alabama Power Company in 1935.

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APPLIED quickly, inexpensively at the groundline, Osmose preservatives penetrate deeply into pole, positively preventing further decay. Cost averages only $1 to $2.00 per pole (including labor), yet adds 7 to 10 years of service life to the pole. Requires no treating equipment. Application as simple as A-B-C. More than 50 leading utility properties endorse its effectiveness. For complete details address—

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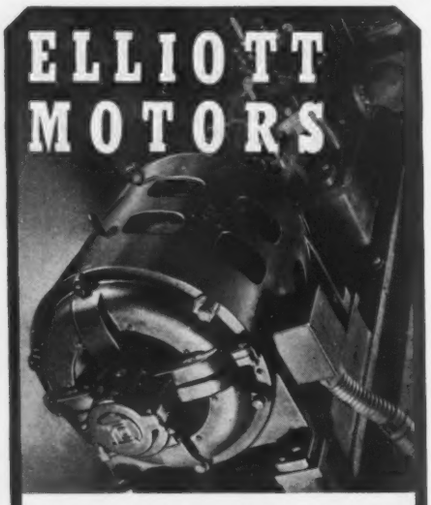

THE ENGINEER OF A CERTAIN PLANT

had heard that Elliott made good motors. He put one on his boiler feed pump . . . He says it's the smoothest, quietest boiler feeder he ever saw. It's a tip for you! Why not check on Elliott motors?

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Steam Turbines • Generators • Motors • Blowers
Condensers • Ejectors • Deaerators • Tube Cleaners
Feedwater Heaters • Strainers • Power Accessories

Watch Water Heater Loading on Distribution Transformers

[*Continued from page 53*]

upper one cuts in. Such an interlock will not interfere in the least with the normal service rendered by the heater. This device on the heaters covered in the study that were operated with upper element "floating" would have reduced the peak demands on the four transformers whose peaks included demands of the upper elements.

The maximum possible demand of an individual water heater is reduced one-third to one-half by such an interlock. This reduction is worth going after if the practice of "floating" upper units is to become more prevalent. Interlocks are especially advantageous on the large heaters, because (1) a greater per cent reduction in the maximum possible demand per heater can be obtained in the larger heaters, (2) higher income customers who buy large water heaters are more likely to float the upper elements as a matter of convenience, (3) large water heaters are generally concentrated in certain territories, and (4) people whose income enables them to have large water heaters are more likely to have heavy cooking and lighting demands after the time clocks energize the lower heater elements.

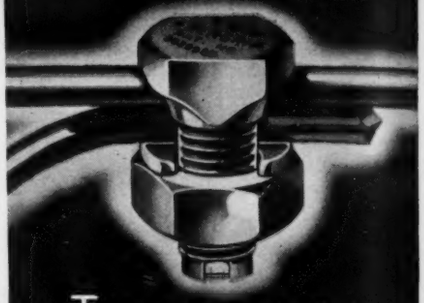
From all this it appears wise to watch distribution transformer loadings closely in the areas when an appreciable number of water heaters are installed. Also, it is becoming important to exercise discrimination as to areas in which water heater sales may be promoted most profitably. For it is only by holding proper balance between water heater and range loads that increased distribution transformer investment can be avoided and justification for the usual low off-peak water heating rate be maintained.

•

Station KDKA to Expand

In order to provide more powerful radio reception for Pittsburgh's metropolitan area, station KDKA will begin construction of a new transmitter headquarters during April near Allison Park, Walter C. Evans, manager of the radio division of the Westinghouse Electric & Manufacturing Co., has announced.

BETTER *Conductivity than a* SOLID WIRE



THE large head on the Blackburn Connector distributes the pressure on the wires over a large surface, producing a very low resistance connection. Tests show that the conductivity of the joint is actually better than the solid wire itself.

for BETTER CONNECTIONS SPECIFY *Blackburn*

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RIGHT—**No. 44 Pole Saw** for trimming larger limbs. Adjustable 16" peg tooth blade, 7 teeth per inch, light in weight. Also (No. 43) with 12" drag tooth blade.

BELOW—**No. 777 Two Hand Pruner** of drop forged tool steel with 28" handles. Provides handy rapid cutting. ALSO—**Bartlett Tree Paint** for preventing growth of wood, destroying fungi, and protecting wounds. Applies with ordinary paint brush.

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BARTLETT

Manufacturing Co.
3048 E. Grand Blvd.
Detroit, Michigan

Design Control Boards for Operating Psychology

[*Continued from page 45*]

easily attracted toward moving stimuli of all kinds. Motion has another advantage in that the periphery of vision is much more sensitive to moving than to stationary stimuli. In simpler terms, attention is more easily attracted to a moving stimulus seen out of the "corner of the eye" than to a stationary object or stimulus. A common example of this is to be found in the fact that we notice moving automobiles at the side of us as we drive along while paying little attention to stationary ones.

This principle of motion has been widely applied as a safety device. Stationary stop lights on the rear of automobiles are being supplanted by flashing lights. In the electric industry the open manhole is today surrounded by intermittent flashing lights and not by the stationary lights used in earlier years. I suspect that there is room for the application of this principle in substation design and construction. For example, on equipment over which the operator is liable to trip it might be possible, through the use of photoelectric cells, to arrange for a light to flash as the operator approaches, in much the same way as a light flashes to warn pedestrians and motorists of an approaching train.

I have noticed that stationary lights are used to identify compartments carrying live equipment. A flashing light might serve a much more useful purpose in this connection. On the switchboard panel itself flashing lights, instead of stationary lights, might be brought into operation in connection with the manipulation of key switches or the handling of particularly hazardous equipment.

There are numerous other factors affecting human response which deserve serious consideration by the engineer. For example, *discontinuous lines or areas* represent better "attention-getting" devices than continuous lines. This means that cross-hatched lines or areas can be used more effectively in identifying or setting off equipment than can solid lines or areas of a single color.

Probably too little attention has been given to the relative *legibility of contrasting colors* used in markers and targets. In general, numerous investigations show that the greatest legibility occurs when there is a

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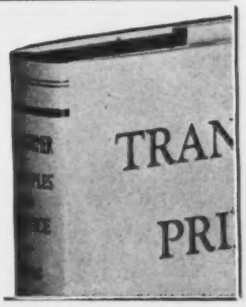
Transformers

— their kinds — fundamentals — uses — operation — maintenance



For the practical man this book deals concisely and plainly with all aspects of transformer construction and use, including underlying principles, applications, connection, testing, care, and economics.

Just published

Transformer Principles and Practice

***By* J. B. GIBBS**

Electrical Engineer, Westinghouse Elec. and Mfg. Co.

210 pages, illustrated, $2.50

FROM this book the reader will get an introduction to the fundamentals of transformer performance and construction, also descriptions of many particular types of transformers, large and small, for various purposes. Usual methods of connecting transformers are described and diagrams given, also special applications of standard transformers, including phase transformation.

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Read GETTING ALONG WITH PEOPLE by MILTON WRIGHT

marked contrast in brightness between type and background. In other words, it is not so much the amount of color, rather the way in which it is employed, that is important from the standpoint of attention. Numerous studies of legibility of various color combinations are available upon which the engineer can draw in designing markers of all kinds and in using contrast effects on panels and elsewhere.

BOOK REVIEWS

Government Price Fixing

By Jules Backman. Published by Pitman Publishing Corp., 2 West 45th Street, New York, N. Y. 304 pages. Price, $3.

A fine selected bibliography has been incorporated by Dr. Backman in his new book which brings out the pitfalls which government and industry must carefully consider before attempting to "rig" prices of commodities or products. The various forms of government price fixing, direct and indirect, are presented, and the ends sought and the means devised to attain the ends are considered, as are the reasons for the uniform record of disappointments. Price fixing has failed to meet with any more success than it has under government supervision. This book is of interest to the management of industry because in this age many companies are prone to support government efforts to fix prices in what should be a competitive market.

•

Electrical Year Book 1939

Published by Emmott & Co., Ltd., 31 King St., West, Manchester 3, England. 177 pp. Price, 1/6 net (about 40 cents).

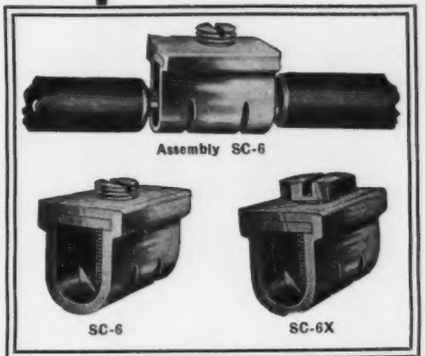
In this year's edition of this pocket-size reference book the section on a.c. systems has been rewritten and new material added on exciters to the section treating of turbo-alternators. The subject of meter accuracy and testing has been revised in the light of British regulations on this subject. Rectifier-type instruments are included in this year's edition and new information presented on instrument transformers and testing sets, including "meggers."

WIDE RANGE OF WIRE CAPACITIES MAKES POSSIBLE QUICK, SAFE, STRONG CONNECTIONS AT LOWER COST . . . .

SHERMAN

Wedge Grip

CONNECTORS



● For service entrance and all small wire connections. Tough bronze, screw peened in to prevent loss, V-shaped corrugations to insure tight grip, copper body for highest conductivity. Four sizes for No. 12 to No. 2 stranded wire. Two types of screw—hexagon or plain headless. Send for Bulletin No. 22.

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No need to twist or solder service wires if you use Sherman Wedge-Grip Connectors. These connectors were created by the modern Sherman method after careful research and experiment. All weaknesses of previous types have been eliminated. Workmen and management alike prefer Sherman Wedge-Grip Connectors because of time saving and convenience. A turn of the screwdriver and the job is done—you have a smooth, streamlined joint. Easily disconnected and can be used over and over again which is an advantage especially in service entrance work. Send for a sample and try it in actual use.

H. B. Sherman Mfg. Co.
Battle Creek, Mich.

Thousands of Dollars Saved!

WITH THIS

FAMOUS TRICO COMBINATION

TRICO Powder-Packed FUSES

The renewal element is different—it's **self-contained, powder-packed,** positively **tamper-proof,** and **non-interchangeable** with ordinary "bare-links". The powder packing **reinforces** the fusible link—it cannot sag, stretch, or weaken.

KLIPLOK CLAMPS

Lock fuses and clips together. Eliminate burnt fuses and clips—unnecessary shutdowns and wasted current caused by over-heating. A size for every clip. **USE KLIPLOKS EVERYWHERE!**

WRITE

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K-P-F

Self-aligning, self-releasing, full-floating, SILVER-PLATED contacts insure permanent ease of operation.

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Box Numbers in care of any of our New York, Chicago, or San Francisco offices count 10 words additional in undisplayed ads.

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330 West 42d St., New York City

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